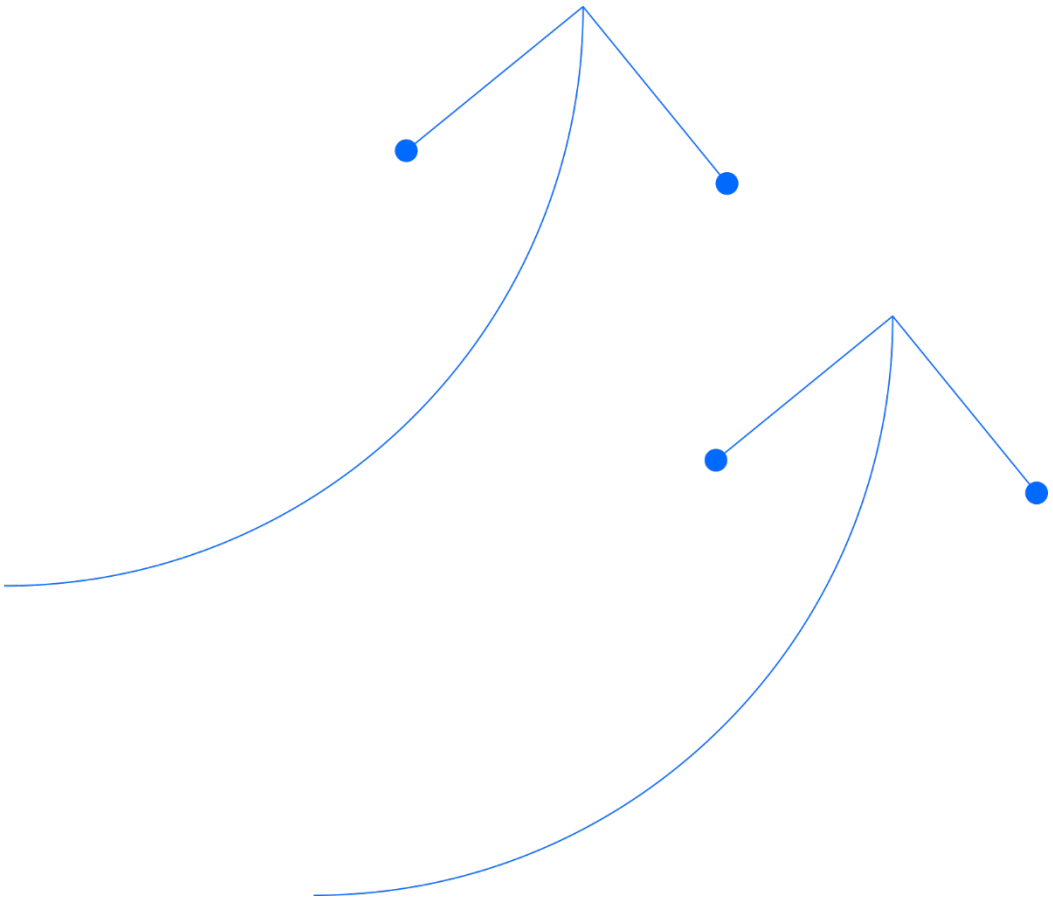
Santos

# Bedout Multi-Well Exploration and Appraisal Drilling

## Environment Plan

February 2026

Document No.: 7720-650-EMP-0005



# Bedout Multi-Well Exploration and Appraisal Drilling

## Environment Plan

Document No.: 7720-650-EMP-0005

| | |
|---|---|
| **Project / facility** | Bedout Multi-Well Exploration and Appraisal Drilling |
| **Review interval (months)** | 60 Months |
| **Safety critical document** | No |

| Rev | Owner | Reviewer(s) *Managerial/Technical/Site* | Approver |
|---|---|---|---|
| | **Offshore D&C Operations Manager** | **Approvals Manager – WANATL** | **General Manager – Drilling and Completions and Decommissioning WANATL** |
| 1 | Mark Salera  | Dawn MacInnes  | Jason Young  |

| Rev | Rev Date | Author / Editor | Amendment |
|---|---|---|---|
| A | 15 Nov 2024 | Worley Consulting | Issued for Review |
| B | 27 May 2025 | Worley Consulting | Issued for Review |
| Ba | 09 Jul 2025 | Worley Consulting | Issued for Review |
| C | 05 Sep 2025 | Worley Consulting | Issued for Review |
| 0 | 03 Dec 2025 | Santos | Issued for Submission to NOPSEMA |
| 1 | 03 Feb 2026 | Santos | Updated to address public comments |

*Any hard copy of this document, other than those identified above, is uncontrolled. Refer to the Santos Offshore Business Document Management System for the latest revision.*

# Contents


**Units of measurement** **12**

**Abbreviations and Acronyms** **13**

**1. Introduction** **16**

**1.1** Environment Plan Summary 16

**1.2** Purpose of this Environment Plan 16

**1.3** Activity Overview 17

**1.4** Titleholder 17

**1.4.1** Details of the Titleholder 17

**1.4.2** Details for Nominated Liaison Person 18

**1.4.3** Notification Procedure in the Event of Changed Details 18

**1.5** Environmental Management Framework 18

**1.5.1** Environment Policy 18

**1.6** Legislative Framework 18

**1.6.1** International Legislation 19

**1.6.2** Commonwealth and State legislation 19

**2. Activity Description** **20**

**2.1** Activity Overview 20

**2.1.1** Operational Areas (OAs) 21

**2.1.2** Exclusion and Cautionary Zone 25

**2.1.3** Timing and Duration 25

**2.2** Equipment Spread 25

**2.2.1** Mobile Offshore Drilling Unit (MODU) 25

**2.2.2** Support Vessels 26

**2.2.3** Helicopters 26

**2.2.4** Remotely Operated Vehicle (ROV) 26

**2.3** Survey Activities 27

**2.3.1** Geophysical Surveys 27

**2.3.2** Hydrographic Surveys 27

**2.3.3** Geotechnical Surveys 27

**2.4** Drilling Activities 28

**2.4.1** Drilling Phases 28

**2.4.2** Move in and Rig Up (MIRU) 29

**2.4.3** Drilling Fluids 29

**2.4.4** Drilling Chemicals 30

**2.4.5** Drilled Solids (Cuttings) 30

**2.4.6** Cement Operations 30

**2.4.7** Well Re-spud and Sidetrack Drilling 31

**2.4.8** Well Evaluation 31

**2.4.9** Abandonment 31

**2.4.10** Cyclone Response 31

2.4.11 Logistics and Support Activities 32
2.4.12 End of Activity 32
2.5 Chemical Assessment 32
2.5.1 Ecotoxicity Assessment 32
2.5.2 Biodegradation Assessment 33
2.5.3 Bioaccumulation Assessment 33
3. Existing Environment Description 35
3.1 Environment that May be Affected 35
3.1.1 Determining the EMBA 35
3.1.2 Planning Area for Scientific Monitoring 37
3.2 Environmental Values and Sensitivities 39
3.2.1 Protected Matters Search Tool Reports 39
3.2.2 Physical Environment 39
3.2.3 Bioregions 41
3.2.4 Benthic Habitats 43
3.2.5 Protected and Significant Areas 48
3.2.6 Threatened and Migratory Fauna 59
3.2.7 Socio-economic Receptors 85
3.2.8 Windows of Sensitivity 103
4. Stakeholder Consultation 107
4.1 Consultation summary 107
4.2 Regulatory requirements 108
4.3 Government and industry guidance 109
4.4 Case Law and Guidance 109
4.5 Santos' consultation methodology 110
4.5.1 Overview 110
4.5.2 Consultation planning 111
4.5.3 Consultation 127
4.5.4 Environment Plan development 130
5. Environmental Impact and Risk Assessment 131
5.1 Impact and Risk Assessment Terminology 131
5.2 Summary of the Environmental Impact and Risk Assessment Approach 132
5.2.1 Overview 132
5.2.2 Context Setting 133
5.2.3 Describe the Activities and Hazards (planned and unplanned events) 133
5.2.4 Identify Receptors and Determine Nature and Scale of Impacts 133
5.3 Describe the Environmental Performance Outcomes and Control Measures 134
5.4 Determine the Impact Consequence Level and Risk Rankings (on the basis that all control measures have been implemented) 135
5.5 Cultural Features Assessment 136
5.6 Evaluate if Impacts and Risks are as Low as Reasonably Practicable 136
5.7 Evaluate Impact and Risk Acceptability 137

**6. Planned Activities Risk and Impact Assessment 139**
**6.1** Interaction with Other Marine Users 140
**6.1.1** Description of Event 140
**6.1.2** Nature and Scale of Environmental Impacts 140
**6.1.3** Environmental Performance Outcomes and Control Measures 141
**6.1.4** Environmental Impact Assessment 146
**6.1.5** Demonstration of As Low as Reasonably Practicable 146
**6.1.6** Acceptability Evaluation 148
**6.2** Seabed and Benthic Habitat Disturbance 150
**6.2.1** Description of Event 150
**6.2.2** Nature and Scale of Environmental Impacts 150
**6.2.3** Environmental Performance Outcomes and Control Measures 151
**6.2.4** Environmental Impact Assessment 153
**6.2.5** Demonstration of As Low as Reasonably Practicable 153
**6.2.6** Acceptability Evaluation 154
**6.3** Light Emissions 156
**6.3.1** Description of Event 156
**6.3.2** Nature and Scale of Environmental Impacts 156
**6.3.3** Environmental Performance Outcomes and Control Measures 159
**6.3.4** Environmental Impact Assessment 162
**6.3.5** Demonstration of As Low as Reasonably Practicable 163
**6.3.6** Acceptability Evaluation 164
**6.4** Noise Emissions 165
**6.4.1** Description of Event 165
**6.4.2** Nature and Scale of Environmental Impacts 168
**6.4.3** Environmental Performance Outcomes and Control Measures 175
**6.4.4** Environmental Impact Assessment 179
**6.4.5** Demonstration of as Low as Reasonably Practicable 180
**6.4.6** Acceptability Evaluation 181
**6.5** Atmospheric Emissions 184
**6.5.1** Description of Event 184
**6.5.2** Nature and Scale of Environmental Impacts 184
**6.5.3** Environmental Performance Outcomes and Control Measures 186
**6.5.4** Environmental Impact Assessment 189
**6.5.5** Demonstration of as Low as Reasonably Practicable 190
**6.5.6** Acceptability Evaluation 191
**6.6** Planned Operational Discharges 192
**6.6.1** Description of Event 192
**6.6.2** Nature and Scale of Environmental Impacts 193
**6.6.3** Environmental Performance Outcomes and Control Measures 195
**6.6.4** Environmental Impact Assessment 199
**6.6.5** Demonstration of as Low as Reasonably Practicable 199
**6.6.6** Acceptability Evaluation 200

6.7 Drilling Discharges 201
6.7.1 Description of Event 201
6.7.2 Nature and Scale of the Environmental Impacts 204
6.7.3 Environmental Performance Outcomes and Control Measures 208
6.7.4 Environmental Impact Assessment 214
6.7.5 Demonstration of as Low as Reasonably Practicable 215
6.7.6 Acceptability Evaluation 216
6.8 Spill Response Operations 217
6.8.1 Description of Event 217
6.8.2 Nature and Scale of Environmental Impacts and Risks for the Activities 217
6.8.3 Environmental Performance and Control Measures 221
6.8.4 Environmental Impact Assessment 223
6.8.5 Demonstration of as Low as Reasonably Practicable 226
6.8.6 Acceptability Evaluation 227
**7. Environmental Risk Assessment for Unplanned Events 228**
7.1 Release of Solid Objects 229
7.1.1 Description of Event 229
7.1.2 Nature and Scale of Environmental Impacts 229
7.1.3 Environmental Performance Outcomes and Control Measures 230
7.1.4 Environmental Impact Assessment 231
7.1.5 Demonstration of as Low as Reasonably Practicable 232
7.1.6 Acceptability Evaluation 232
7.2 Introduction of Invasive Marine Species 234
7.2.1 Description of Event 234
7.2.2 Nature and Scale of Environmental Impacts 234
7.2.3 Environmental Performance Outcomes and Control Measures 235
7.2.4 Environmental Impact Assessment 236
7.2.5 Demonstration of as Low as Reasonably Practicable 237
7.2.6 Acceptability Evaluation 237
7.3 Marine Fauna Interactions 239
7.3.1 Description of Event 239
7.3.2 Nature and Scale of Environmental Impacts 239
7.3.3 Environmental Performance Outcomes 240
7.3.4 Environmental Impact Assessment 242
7.3.5 Demonstration of as Low as Reasonably Practicable 243
7.3.6 Acceptability Evaluation 243
7.4 Non-hydrocarbon and Chemical Releases 245
7.4.1 Description of Event 245
7.4.2 Nature and Scale of Environmental Impacts 245
7.4.3 Environmental Performance Outcomes and Control Measures 246
7.4.4 Environmental Impact Assessment 248
7.4.5 Demonstration of as Low as Reasonably Practicable 249

**7.4.6** Acceptability Evaluation 249
**7.5** Overview of Unplanned Release of Hydrocarbons 251
**7.5.1** Spill Scenario Selection 251
**7.5.2** Spill Modelling Overview 252
**7.5.3** Hydrocarbon Characteristics 255
**7.5.4** Hydrocarbon Exposure Values 259
**7.5.5** Spill Risk Assessment Approach 263
**7.5.6** Spill Response Strategies 276
**7.6** Hydrocarbon Spill: Loss of Well Control 276
**7.6.1** Description of Event 276
**7.6.2** Nature and Scale of Environmental Impacts 279
**7.6.3** Net Environmental Benefit Analysis 279
**7.6.4** Environmental Impact Assessment 280
**7.6.5** Environmental Performance Outcomes and Control Measures 286
**7.6.6** Demonstration of as Low as Reasonably Practicable 289
**7.6.7** Acceptability Evaluation 291
**7.7** Hydrocarbon Spill: Marine Diesel Oil 293
**7.7.1** Description of Event 293
**7.7.2** Nature and Scale of Environmental Impacts 294
**7.7.3** Net Environmental Benefit Analysis 294
**7.7.4** Environmental Impact Assessment 294
**7.7.5** Environmental Performance Outcomes and Control Measures 296
**7.7.6** Demonstration of as Low as Reasonably Practicable 302
**7.7.7** Acceptability Evaluation 303
**7.8** Minor Hydrocarbon Release (Surface and Subsea) 304
**7.8.1** Description of Event 304
**7.8.2** Nature and Scale of Environmental Impacts 304
**7.8.3** Environmental Performance Outcomes and Control Measures 305
**7.8.4** Environmental Impact Assessment 307
**7.8.5** Demonstration of as Low as Reasonably Practicable 308
**7.8.6** Acceptability Evaluation 308

**8. Implementation Strategy 310**
**8.1** Environmental Management System 310
**8.2** Environment Policy 310
**8.3** Hazard Identification, Risk and Impact Assessment and Controls 310
**8.4** Environmental Performance Outcomes 311
**8.4.1** Control Measures and Performance Standards 311
**8.5** Roles and Responsibilities 319
**8.6** Workforce Training and Competency 321
**8.6.1** Activity Inductions 321
**8.6.2** Training and Competency 321
**8.6.3** Workforce Involvement and Stakeholder Communications 321

**8.7** Emergency Preparedness and Response 322
**8.8** Incident Reporting, Investigation and Follow Up 322
**8.9** Reporting and Notifications 323
**8.9.1** Notifications and Compliance Reporting 323
**8.9.2** Monitoring and Recording Emission and Discharges 329
**8.10** Document Management 329
**8.10.1** Information Management and Document Control 329
**8.10.2** Management of Change 329
**8.10.3** Reviews 332
**8.11** Audits and Reviews 332
**8.11.1** Audits 332
**8.11.2** Inspections 333
**8.11.3** Non-conformance Management 333
**8.11.4** Continuous Improvement 333
**8.12** Post Acceptance Consultation Implementation Strategy 333
**8.12.1** Government authorities 334
**8.12.2** Local Government, Communities and Industry 334
**8.12.3** First Nations People and Groups 334

**9. References 339**

**Appendix A Santos Environment Policy 349**

**Appendix B Legislative Framework 350**

**Appendix C Bedout Basin Exploration and Appraisal Drilling Values and Sensitivities of the Marine and Coastal Environment 363**

**Appendix D Protected Matters Search Tool Reports 364**

**Appendix E Aboriginal Cultural Heritage Inquiry System Report for Hydrocarbon Spill EMBA 365**

**Appendix F Consultation 366**

**Appendix G Environmental Consequence Descriptors 367**

**Appendix H Spill Modelling Results 368**

# Tables

Table 1-1: Titleholder details for permits ....17
Table 2-1: Summary of key activity....21
Table 2-2: Location of the Operational Areas covered in this EP....24
Table 2-3: Distances of Key Islands/Mainland from the Operational Areas....24
Table 2-4: Estimated discharge of drilling fluids per well ....29
Table 2-5: Estimated discharges of drill cuttings per well ....30
Table 2-6: Estimated discharge volumes of cement during drilling per well ....31
Table 2-7: Initial OCNS grouping....33

Table 2-8: Aquatic species toxicity grouping ....33
Table 3-1: Hydrocarbon exposure values of the environment that may be affected ....36
Table 3-2: Hydrocarbon exposure values for the Planning Area for Scientific Monitoring ....37
Table 3-3: Integrated Marine and Coastal Regionalisation of Australia 4.0 provincial bioregions relevant to the Activity ....41
Table 3-4: Summary of the ecotypes in and adjacent to the OAs ....43
Table 3-5: Benthic habitats within the EMBA ....47
Table 3-6: Distance from Operational Area boundaries to protected areas and key ecological features within the EMBA ....50
Table 3-7: Australian and State marine management zones ....58
Table 3-8: Prescriptions/conditions from the North-West and South-West Marine Parks Network Management Plan 2018 relevant to the activities in this EP ....58
Table 3-9: Environmental values and sensitivities within the environment that may be affected and OA – threatened and migratory marine fauna ....61
Table 3-10: BIAs and habitat critical to survival identified in the combined OA and environment that may be affected ....67
Table 3-11: Relevant threats identified in recovery plans, conservation advice and management plans for species that occur or may occur within the OA and EMBA ....79
Table 3-12: Commonwealth and state fisheries that overlap the OAs and environment that may be affected ....91
Table 3-13: Nearest shipping fairways to the OAs ....100
Table 3-14: Windows of sensitivity in the vicinity of the OAs and environment that may be affected ....104
Table 4-1: Consultation requirements under the OPGGS(E)R ....108
Table 4-2: Relevant Person terms and definitions ....110
Table 4-3: Historic consultation ....112
Table 4-4: Actions to identify authorities, persons and organisations for consultation ....115
Table 4-5: Summary of public awareness campaign ....117
Table 4-6: Authorities consulted for this EP ....119
Table 4-7: Persons or organisations consulted for this EP ....121
Table 4-8: Summary of consultation activities ....129
Table 5-1: Impact and Risk Assessment Terms ....131
Table 5-2: Summary Environmental Consequence Descriptors ....135
Table 5-3: Likelihood Description ....135
Table 5-4: Santos Risk Matrix ....136
Table 5-5: Activity relevant principles of Ecologically Sustainable Development ....137
Table 6-1: Summary of the consequence level rankings for hazards associated with planned events ....139
Table 6-2: Control measures evaluation for interaction with other marine users ....141
Table 6-3: Control measures evaluation for seabed disturbance ....151
Table 6-4: Control measures evaluation for light emissions ....160
Table 6-5:Terms used in this underwater noise assessment ....165
Table 6-6: Estimated frequency and sound ranges for geophysical survey equipment ....168
Table 6-7: Thresholds for PTS, TTS and behavioural response onset for cetaceans, sirenians and pinnipeds for continuous noise ....170
Table 6-8: Thresholds for PTS, TTS and behavioural response onset for cetaceans and sirenians for impulsive noise ....170
Table 6-9: Acoustic effects of continuous noise on marine turtles ....172

Table 6-10: Acoustic effects of impulsive noise on marine turtles....172
Table 6-11: Continuous noise: Criteria for noise exposure for fish, adapted from Popper et al. (2014)....173
Table 6-12: Impulsive noise: Criteria for noise exposure for fish, adapted from Popper et al. (2014)....174
Table 6-13: Impulsive noise: Sound levels relevant to invertebrates....175
Table 6-14: Control measures evaluation for noise emissions....175
Table 6-15: Estimated Direct GHG emissions over a 5-year period....185
Table 6-16: Control measure evaluation for atmospheric emissions....186
Table 6-17: Control measures evaluation for planned operational discharges....195
Table 6-18: Decision framework for managing bulk powders remaining on the MODU at the end of the development/activity....204
Table 6-19: Control measures evaluation for planned drilling discharges....208
Table 6-20: Control measures evaluation-Spill Response Operations....221
Table 7-1: Summary of risk assessment ranking for unplanned activities....228
Table 7-2: Control measure evaluation for the unplanned release of solid objects....230
Table 7-3: Control measure evaluation for unplanned introduction of invasive marine species....235
Table 7-4: Control measure evaluation for marine fauna interaction....241
Table 7-5: Control measure evaluation for non-hydrocarbon and chemical releases....246
Table 7-6: Summary of Largest Credible Hydrocarbon Spill Scenarios....251
Table 7-7: Summary of worst-case spill scenarios for surface and subsea LOWC scenarios....252
Table 7-8: Summary of modelled vessel collision spill scenario....255
Table 7-9: Characteristics of Caley crude....255
Table 7-10: Boiling point ranges for Caley crude....255
Table 7-11: Characteristics of MDO....257
Table 7-12: Boiling point ranges for MDO....258
Table 7-13: Floating hydrocarbons exposure values....260
Table 7-14: Shoreline hydrocarbons accumulation exposure values....260
Table 7-15: Dissolved hydrocarbon exposure values....261
Table 7-16: Entrained hydrocarbons exposure values....262
Table 7-17: Physical and chemical pathways for hydrocarbon exposure and potential impacts to receptors....267
Table 7-18: Nature and scale of hydrocarbon spills on environment and socio-economic receptors within the EMBA....271
Table 7-19: Summary of results (Stochastic Modelling)....277
Table 7-20: Hotspot Analysis for LOWC scenarios....280
Table 7-21: Impact, likelihood and consequence ranking – loss of well control....283
Table 7-22: Control measure evaluation for hydrocarbon spill-LOWC....286
Table 7-23: Identified high environmental value and hot spot receptors for surface release scenario – marine diesel oil....294
Table 7-24:Control measure evaluation for hydrocarbon spill – MDO....297
Table 7-25: Control measure evaluation for minor release of hydrocarbon....305
Table 8-1: Environmental Performance Outcomes....311
Table 8-2: Control Measures and Environmental Performance Standards for the Proposed Activity (Environment Plan)....312
Table 8-3: Chain of command, key leadership roles and responsibilities....319
Table 8-4: Activity notification and reporting requirements....324

Table 8-5: Monitoring methods for emissions and discharges ..... 329
Table 8-6: Consultation and standing arrangement notifications ..... 335

# Figures

Figure 2-1: Location of the Bedout Multi-Well Exploration and Appraisal Drilling OAs ..... 23
Figure 3-1: Socio-economic and ecological EMBA ..... 38
Figure 3-2: Integrated Marine and Coastal Regionalisation of Australia 4.0 provincial bioregions in relation to the EMBA and OAs ..... 42
Figure 3-3: Ecotypes overlapping the OAs based on CSIRO habitat modelling (Keesing et al., 2020) ..... 44
Figure 3-4: Australian Marine Parks in the vicinity of the OAs and environment that may be affected ..... 53
Figure 3-5: State Marine Parks and Marine Management Areas in the vicinity of the OAs and environment that may be affected ..... 54
Figure 3-6: Key ecological features in the vicinity of the OAs and environment that may be affected ..... 55
Figure 3-7: Heritage areas in the vicinity of the OAs and environment that may be affected ..... 56
Figure 3-8: Wetlands of international significance (RAMSAR) in the vicinity of the OAs and environment that may be affected ..... 57
Figure 3-9: BIAs for whale sharks in the vicinity of the OAs and the environment that may be affected ..... 69
Figure 3-10: BIAs for pygmy blue whales in the vicinity of the OAs and the environment that may be affected ..... 70
Figure 3-11: BIAs for humpback whales in the vicinity of the OAs and the environment that may be affected ..... 71
Figure 3-12: BIAs for southern right whales in the vicinity of the OAs and the environment that may be affected ..... 72
Figure 3-13: BIAs for dugongs in the vicinity of the OAs and the environment that may be affected ..... 73
Figure 3-14: BIAs for loggerhead turtles in the vicinity of the OAs and the environment that may be affected ..... 74
Figure 3-15: BIAs for hawksbill turtles in the vicinity of the OAs and the environment that may be affected ..... 75
Figure 3-16: BIAs areas for green turtles in the vicinity of the OAs and the environment that may be affected ..... 76
Figure 3-17: BIAs for flatback turtles in the vicinity of the OAs and the environment that may be affected ..... 77
Figure 3-18: BIAs for seabirds in the vicinity of the OAs and the environment that may be affected ..... 78
Figure 3-19: RATSIB areas in the vicinity of the OAs and environment that may be affected ..... 88
Figure 3-20: Native Title determinations, ILUA and IPAs in the vicinity of the OAs and environment that may be affected ..... 89
Figure 3-21: Commonwealth-managed fisheries in relation to the EMBA and operational areas ..... 95
Figure 3-22: State-managed fisheries in relation to the EMBA and operational areas (Figure 1 of 3) ..... 96
Figure 3-23: State-managed fisheries in relation to the EMBA and operational areas (Figure 2 of 3) ..... 97
Figure 3-24: State-managed fisheries in relation to the EMBA and operational areas (Figure 3 of 3) ..... 98
Figure 3-25: Pilbara fish trawl managed fishery catch effort (2013–2023) ..... 99
Figure 3-26: Commercial shipping and AMSA fairways in relation to the EMBA and operational areas ..... 101
Figure 3-27: Defence training areas in relation to the EMBA and operational area ..... 103
Figure 5-1: Hazard identification and Assessment Guideline ..... 133
Figure 5-2: Hierarchy of Controls ..... 134
Figure 6-1: Visibility of different wavelengths of light in humans and wildlife is shown by horizontal lines. Black dots represent reported peak sensitivity (Commonwealth of Australia, 2023). ..... 157
Figure 6-2: Conceptual model for the dispersion of WBM following discharge in the sea ..... 205
Figure 7-1: Release locations within the OAs ..... 254
Figure 7-2: Simulated weathering of a 50 $m^3$ surface release of Caley crude subjected to a constant 5 knot (2.6 m/s) wind ..... 256

Figure 7-3: Simulated weathering of a 50 $m^3$ surface release of Caley crude subjected to variable wind speeds..257

Figure 7-4: Mass balance plot for an instantaneous 50 $m^3$ surface release of MDO subjected to a constant 5 knot (2.6 m/s) wind, currents and 27 °C water temperature.....258

Figure 7-5: Mass balance plot for an instantaneous 50 $m^3$ surface release of MDO subjected to variable wind speeds of 2–23 knots (1–12 m/s), currents and 27 °C water temperature.....259

Figure 7-6: Santos oil spill risk assessment approach .....264

Figure 7-7: HEV areas within the EMBA .....266

Figure 7-8: Difference in cumulative vs continuous exposure.....282

Figure 8-1: EP MoC process schematic.....331

# Units of measurement

| Unit | Description |
|---|---|
| °C | degrees centigrade |
| cP | centipoise |
| dB | decibels |
| dB(A) | decibels A-weighting |
| g/m² | grams per square metre |
| hrs | hours |
| Hz | hertz |
| kHz | kilohertz |
| km | kilometre (1,000 metres) |
| km² | square kilometres |
| L | litre (1,000 ml) |
| m | metre (100 cm) |
| m² | square metre |
| m³ | cubic metre |
| mg/L | milligrams per litre |
| ml | millilitre |
| nm | nautical mile (1.856 km) |
| Pa | Pascal (unit of pressure) |
| ppb | parts per billion |
| ppm | parts per million |
| t | tonne (1,000 kg) |

# Abbreviations and Acronyms

| Abbreviation/Acronym | Definition |
|---|---|
| ACHIS | Aboriginal Cultural Heritage Inquiry System |
| ACN | Australian Company Number |
| Activity | As described in Section 2 of this EP |
| AEP | Australian Energy Producers |
| AFMA | Australian Fisheries Management Authority |
| AFZ | Australian Fishing Zone |
| AHO | Australian Hydrographic Office |
| ALARP | As low as reasonably practicable |
| AMOSC | Australian Marine Oil Spill Centre |
| AMPs | Australian Marine Parks |
| AMSA | Australian Maritime Safety Authority |
| BC Act | *WA Biodiversity Conservation Act 2016* |
| BIA | Biologically important area |
| CEFAS | Centre for Environment, Fisheries and Aquaculture Science |
| CFA | Commonwealth Fishing Association |
| $CH_4$ | Methane |
| CHARM | Chemical hazard and risk management |
| CM | Control measure |
| CMID | Common Marine Inspection Document |
| CMMS | Computerised maintenance management system |
| CMP | Conservation management plan |
| $CO_2$ | Carbon dioxide |
| DAFF | Department of Agriculture, Fisheries and Forestry (Commonwealth) |
| DAH | Dissolved aromatic hydrocarbon |
| DAWE | Department of Agriculture, Water and Environment, now Department of Climate Change, Energy, the Environment and Water (DCCEEW) and Department of Agriculture, Fisheries and Forestry (DAFF) |
| DBCA | Department of Biodiversity, Conservation and Attractions (Western Australia) |
| DCCEEW | Department of Climate Change, Energy, the Environment and Water |
| DEWHA | Department of the Environment, Water, Heritage, and the Arts, now Department of Climate Change, Energy, the Environment and Water (DCCEEW) |
| DISR | Department of Industry, Science and Resources |
| DMPE | Department of Mines, Petroleum and Exploration |
| DNP | Director of National Parks |
| DOEE | Department of Environment and Energy, now Department of Climate Change, Energy, the Environment and Water (DCCEEW) |
| DoT | Western Australia Department of Transport (now Department of Transport and Major Infrastructure) |
| DP | Dynamic positioning |
| DPIRD | Department of Primary Industries and Regional Development |
| DPLH | Department of Planning, Lands and Heritage |
| DSEWPaC | former Department of Sustainability, Environment, Water, Population and Communities, now Department of Climate Change, Energy, the Environment and Water (now DCCEEW) |
| DTMI | Department of Transport and Major Infrastructure |

| Abbreviation/Acronym | Definition |
|---|---|
| EMBA | Environment that may be affected |
| ENVID | Environmental hazard identification workshop |
| EP | Environment Plan |
| EPA | Environmental Protection Authority |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| EPO | Environment performance outcome |
| EPSs | Environmental performance standards |
| ESD | Ecologically sustainable development |
| GHG | Greenhouse gas |
| HAZID | Hazard identification |
| HAZMAT | Hazardous material |
| HEV | High environmental value |
| HOCNF | Harmonised offshore chemical notification format |
| HSE | Health, safety, and environment |
| IMMR | Inspection, monitoring, maintenance, and repair |
| IMO | International Maritime Organization |
| IMS | Invasive marine species |
| IMSMP | Invasive Marine Species Management Plan |
| IMT | Incident Management Team |
| IUCN | International Union for Conservation of Nature |
| JRCC | Joint Rescue Coordination Centre |
| KEF | Key Ecological Feature |
| LOWC | Loss of well control |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MC | Measurement criteria |
| MDO | Marine Diesel Oil |
| MEG | Monoethylene glycol |
| MNES | Matter of national environment significance |
| MoC | Management of change |
| MODU | Mobile offshore drilling unit |
| MoU | Memorandum of Understanding |
| MPNMP | Marine Park Network Management Plan |
| $N_2O$ | Nitrous oxide |
| NEBA | Net environmental benefit analysis |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NOPSEMA | National Offshore Petroleum Safety and Environmental Management Authority |
| NOx | Nitrogen oxides |
| NWS | North West Shelf |
| OCNS | Offshore Chemical Notification Scheme |
| ODS | Ozone depleting substances |
| OECD | Organisation for Economic Co-operation and Development |
| OIW | Oil in water |

| Abbreviation/Acronym | Definition |
|---|---|
| OPEP | Oil Pollution Emergency Plan |
| OPGGS (E) R | Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 |
| OPGGS Act | *Offshore Petroleum and Greenhouse Gas Storage Act 2006* |
| OSCA | Oil spill control agents |
| OVID | Offshore Vessel Inspection Database |
| PAHs | Polycyclic aromatic hydrocarbons |
| PLONOR | Pose little or no risk (to the environment) |
| PMS | Planned maintenance system |
| PMST | Protected matters search tool |
| PPAs | Protection priority areas |
| PSZ | Petroleum safety zone |
| PTS | Permanent threshold shift |
| ROV | Remotely operated vehicle |
| SDS | Safety datasheet |
| SFRT | Subsea first response toolkit |
| SIMAP | Spill Impact Mapping and Analysis Program |
| SMPEP | Shipboard Marine Pollution Emergency Plan |
| SMS | Santos Management System |
| SOLAS | Safety of life at sea |
| SOPEP | Shipboard Oil Pollution Emergency Plan |
| TSSC | Threatened species scientific committee |
| TTS | Temporary threshold shift |
| VAP | Vertical acoustic profiling |
| VSP | Vertical seismic profiling |
| WA | Western Australia |
| WAFIC | Western Australian Fishing Industry Council |
| WBM | Water based mud |
| WCD | Worst case discharge |
| WDCS | Whale and Dolphin Conservation Society |
| WOMP | Well Operations Management Plan |

# 1. Introduction

## 1.1 Environment Plan Summary

| Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 Requirements |
|---|
| **Section 35(6)** |
| Within 10 days after receiving notice that NOPSEMA has accepted an environment plan (whether in full, in part or subject to limitations or conditions), the titleholder must submit a summary of the accepted plan to NOPSEMA for public disclosure. |
| **Section 35(7) The Summary** |
| The Summary<br>a) must include the following material from the environment plan:<br>i) the location of the activity;<br>ii) a description of the receiving environment;<br>iii) a description of the activity;<br>iv) details of environmental impacts and risks;<br>v) a summary of the control measures for the activity;<br>vi) a summary of the arrangements for ongoing monitoring of the titleholder's environmental performance;<br>vii) a summary of the response arrangements in the oil pollution emergency plan;<br>viii) details of consultation already undertaken, and plans for ongoing consultation; and<br>ix) details of the titleholder's nominated liaison person for the activity.<br>b) must be to the satisfaction of NOPSEMA. |

This *Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan* (EP) Summary has been prepared from material provided in the EP. The summary consists of the following as required by Section 35 (7):

| EP Summary Material Requirement | Relevant Section of EP containing EP Summary Material |
|---|---|
| The location of the activity | Section 2.1.1 |
| A description of the existing environment | Section 3, Appendix C and Appendix D |
| A description of the activity | Section 2 |
| Details of the environmental impacts and risks | Sections 6 and 7 |
| The control measures for the activity | Sections 6 and 7 |
| The arrangements for ongoing monitoring of the titleholder's environmental performance | Section 8 |
| Response arrangements in the oil pollution emergency plan | Sections 6.8, 7.5, 7.6 and 7.7<br>See *Bedout Multi-Well Exploration and Appraisal Drilling OPEP* (7720-650-EMP-0006) |
| Consultation already undertaken and plans for ongoing consultation | Sections 4 and 8 |
| Details of the titleholders nominated liaison person for the activity | Section 1.4.2 |

## 1.2 Purpose of this Environment Plan

The purpose of the Bedout Multi-Well Exploration and Appraisal Drilling EP is to meet the requirements of Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (OPGGS(E)R) for acceptance by NOPSEMA under section 34 of the Regulations.

In accordance with the OPGGS(E)R, this EP details the environmental impacts and risks associated with the activity and demonstrates how these will be reduced to as low as reasonably practicable (ALARP) and to an acceptable level. The EP provides an implementation strategy that will be used to measure and report on environmental performance during planned activities and unplanned events, to ensure impacts and risks are continuously reduced to ALARP and are at an acceptable level. The environmental management of the activity described in the EP complies with the Santos Environment Policy (Appendix A) and with all relevant legislation (Appendix B). This EP documents and considers all relevant stakeholder consultation performed during the development of the EP.

## 1.3 Activity Overview

Santos WA Northwest Pty Ltd (Santos) proposes to drill up to seven exploration and/or appraisal wells in the Commonwealth waters within the Bedout Basin. The Multi-Well Exploration and Appraisal Drilling EP will cover drilling, evaluating, well testing and abandonment activities related to proposed exploration and appraisal drilling. Activities also include geophysical, hydrographic and geotechnical surveys to gather critical seabed and subsurface data that will enable the safe and accurate placement of a Mobile Offshore Drilling Unit (MODU) to undertake the drilling.

The wells are proposed to be drilled between Q3 2026 and Q3 2031 using a moored semi-submersible MODU and/or jack-up MODU. The wells will each take between ~40–110 days to drill, including contingency. The wells may be drilled singularly or as part of a campaign of multiple wells. The wells will be drilled within the defined Bedout Basin Operational Areas (herein referred to as OAs) named Curie, Ara, Wallace and Mestrel/Bancroft which are in the Exploration Permit Areas WA-541-P, WA-435-P and WA-436-P.

The precise drilling locations within the OAs are not yet defined and it is proposed that until such time, drilling may occur anywhere within a given OA (Figure 2-1). In some areas, the exact location of future wells is subject to further geological interpretation and engineering studies.

The OAs have been defined to allow for drilling exploration opportunities, appraising discovered resources and evaluating nearby prospects if resource aggregation is required.

## 1.4 Titleholder

### 1.4.1 Details of the Titleholder

| Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 Requirements |
|---|
| **Section 23. Details of titleholder and nominated liaison** |
| 23(1) The environment plan must include the following details for the titleholder:<br>i) name;<br>ii) business address;<br>iii) telephone number (if any);<br>iv) fax number (if any);<br>v) email address (if any);<br>vi) if the titleholder is a body corporate that has an ACN (within the meaning of the *Corporations Act 2001*) – ACN.<br>23(2) The environment plan must also include the following details for the titleholder's nominated liaison person:<br>a) name;<br>b) business address;<br>c) telephone number (if any);<br>d) fax number (if any);<br>e) email address (if any).<br>23(3) The environment plan must include arrangements for notifying NOPSEMA of any of the following:<br>(a) a change in the titleholder;<br>(b) a change in the titleholder's nominated liaison for the activity;<br>(c) a change in the contact details for either the titleholder or the nominated liaison |

Santos is the Operator, with joint venture titleholders listed below for the petroleum activities within WA-541-P, WA-435-P and WA-436-P, as covered under this EP. Table 1-1 lists the titleholders and their contact details.

**Table 1-1: Titleholder details for permits**

| Permit | Titleholder | ACN | % Interest | Address |
|---|---|---|---|---|
| WA-541-P | Santos WA Northwest Pty Ltd* | 009 140 854 | 50% | Level 7, 100 St Georges Terrace Perth WA 6000 |
| | BP Developments Australia Pty Ltd | 081 102 856 | 50% | Level 15, 240 St Georges Terrace Perth WA 6000 |
| WA-435-P | Santos WA Northwest Pty Ltd* | 009 140 854 | 60% | Level 7, 100 St Georges Terrace Perth WA 6000 |
| | Santos WA Southwest Pty Limited | 050 611 688 | 20% | |
| | Carnarvon Energy Limited | 002 688 851 | 10% | Level 2, 76 Kings Park Road |

| Permit | Titleholder | ACN | % Interest | Address |
|---|---|---|---|---|
| | | | | West Perth WA 6005 |
| | OPIC Australia Pty Limited | 008 603 487 | 10% | 14F, NO.3, Sungren Road, Shinyi District,<br>Taipei, Taiwan 110207, R.O.C. |
| WA-436-P | Santos WA Northwest Pty Ltd+ | 009 140 854 | 40% | Level 7, 100 St Georges Terrace Perth WA 6000 |
| | Santos WA Southwest Pty Limited | 050 611 688 | 30% | |
| | Carnarvon Energy Limited OPIC | 002 688 851 | 20% | Level 2, 76 Kings Park Road<br>West Perth WA 6005 |
| | OPIC Australia Pty Limited | 008 603 487 | 10% | 14F, NO.3, Sungren Road, Shinyi District,<br>Taipei, Taiwan 110207, R.O.C. |

**operator*

### 1.4.2 Details for Nominated Liaison Person

Details for Santos' nominated liaison person for the activity are as follows:

Name: Dawn MacInnes (Manager Environmental Approvals, WA NA &TL)

Business address: Level 7, 100 St Georges Terrace, Perth, Western Australia (WA) 6000

Telephone number: (08) 6218 7100

Email address: WA.NT.Regulatory@santos.com

### 1.4.3 Notification Procedure in the Event of Changed Details

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

## 1.5 Environmental Management Framework

| OPGGS(E)R) 2023 Requirements |
|---|
| **Section24(a). Other information in the environment plan** |
| The environment plan must contain the following:<br>a) A statement of the titleholder's corporate environmental policy |

### 1.5.1 Environment Policy

The activity will be conducted in accordance with the Santos Environment Policy (Appendix A) and relevant legislative requirements presented within Appendix B, inclusive of references to the relevant EP sections where the legislation may prescribe or control how the activity is undertaken.

Sections 6 and 7 of this EP detail and evaluate impacts and risks from planned activities and unplanned events, provide control measures, set environmental performance outcomes and standards, and provide the strategy for ensuring environmental performance is achieved.

## 1.6 Legislative Framework

| OPGGS(E)R) 2023 Requirements |
|---|
| **Section 21. Environmental assessment** |
| Description of the activity<br>21(4) The environment plan must:<br>a) describe the requirements, including legislative requirements, that apply to the activity and are relevant to the environmental management of the activity; and |

| OPGGS(E)R) 2023 Requirements |
| --- |
| b) demonstrate how those requirements will be met. |

### 1.6.1 International Legislation

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

### 1.6.2 Commonwealth and State legislation

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

All activities conducted under the EP will comply with legislative requirements established under relevant Commonwealth legislation, and in line with applicable guidelines and management procedures. These are further detailed in Appendix B.

In the event of a worst-case credible spill, there is potential for the spill to impact on State waters. Relevant State legislation is detailed in Appendix B. The *Bedout Multi Well Exploration and Appraisal Drilling Oil Pollution Emergency Plan* (7720-650-EMP-0006) provides further detail on Commonwealth and State jurisdictions.

# 2. Activity Description

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 21. Environmental assessment.** |
| Description of the Activity:<br>21 (1) The environment plan must contain a comprehensive description of the activity including the following:<br>a) the location or locations of the activity<br>b) general details of the construction and layout of any facility<br>c) an outline of the operational details of the activity (for example, seismic surveys, exploration drilling or production) and proposed timetables<br>d) any additional information relevant to consideration of environmental impacts and risks of the activity.<br>Note: An environment plan will not be capable of being accepted by the Regulator if an activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, will be undertaken in any part of a declared World Heritage property – see Section 34. |

## 2.1 Activity Overview

This EP provides for site surveys (geophysical, hydrographic and geotechnical), drilling, well evaluation, well testing, and abandonment activities related to exploration and appraisal drilling utilising a moored semi-submersible MODU and/or jack-up MODU (as described in Section 2.2) in four defined OAs within Commonwealth permit areas WA-541-P, WA-435-P and WA-436-P. This is known collectively as 'the activity'. Santos is planning to drill a number of exploration prospects (seven exploration and/or appraisal wells) from Q3 2026, subject to obtaining all regulatory and business approvals.

This EP encompasses similar prospects within the defined OAs. The prospects have varying chances of geologic success based on the exploration teams' characterisation of the key petroleum systems risk elements. The outcome of exploration wells will significantly influence subsequent drilling activities within the OAs. If an exploration well is successful, Santos anticipates data analysis to take between six to eighteen months before appraisal activities or other exploration opportunities within the OA are progressed. This approach removes the need for duplicate EPs in very similar OAs within close geographical proximity to each other (Figure 2-1).

Activities included in the EP are:

- site surveys in preparation for MODU placement
- movement of the MODU within the OAs
- if a semi-submersible is used:
    - installation of pre-lay anchors (if required)
    - mooring of the MODU, deployment and recovery of anchors.
- if a jack-up is used, deployment and recovery of jack-up legs
- general MODU operations including the use of support vessels, helicopters and remotely operated vehicles (ROV).
- MODU and vessel commissioning activities (e.g. equipment testing, tank flushing)
- riserless drilling
- drilling with a closed-circulating fluid system
- installing casing strings
- operation of a blow-out preventer (BOP)
- drilling using water-based drilling fluid systems
- use of lost circulation materials (LCM)
- cementing
- use and discharge of chemicals and additives for drilling, cementing, evaluation, testing and abandonment activities
- well evaluation, including logging-while-drilling, wireline logging, hydrocarbon sampling, vertical acoustic profiling (VAP) and core analysis

- well testing (sampling, clean up and flaring)
- permanent well decommissioning (P&A) activities including pulling casing strings, setting permanent cement barriers and removal of casings and wellheads
- contingency side-track drilling, re-drilling sections and re-spud.

A summary of the activity is listed in Table 2-1.

**Table 2-1: Summary of key activity**

| General Details | |
|---|---|
| **EP expiry date** | Five years from EP acceptance date |
| OAs | The OAs have been specifically defined as the following areas:<br>• Wallace prospect in WA-435-P (water depth ~135–155 m)<br>• Ara prospect in WA-435-P and WA-436-P (water depth ~130–235 m)<br>• Mestrel / Bancroft prospect in WA-541-P (water depth ~80–95 m)<br>• Curie prospect in WA-541-P (water depth ~135–265 m). |
| **Operational Activities** | |
| MODU type | Moored semi-submersible MODU (Wallace, Ara and Curie OAs)<br>Moored semi-submersible MODU and/or jack-up MODU (Mestrel/Bancroft OA) |
| In-field MODU no. | Up to two MODUs at a time (in separate OAs) may be involved with the exploration and appraisal activities covered by this EP |
| Support vessel type | • Offshore multi-purpose<br>• Offshore supply<br>• Anchor handling |
| In-field vessel no. | Typically two, up to four at any time |
| Remotely operated vehicles | Yes |
| Helicopters | Yes |
| **Drilling & Evaluation Activities** | |
| No. of wells | Up to seven exploration and/or appraisal wells |
| Estimated total well depth | 3,000–6,000 m depending on final geological prognosis for each prospect |
| Estimated activity durations | 40–110 days for each well<br>Durations may increase if contingency operations are required, or technical difficulties are encountered |
| Drilling fluid type | Water-based drilling fluids |
| Well testing | Yes |
| Vertical acoustic profiling | Yes |
| Well suspension | Only temporary suspension during the same rig campaign (e.g. for cyclone avoidance or MODU repairs) |
| Well re-entry | No |
| Well decommissioning | All wells to be plugged and decommissioned (P&A) in accordance with a NOPSEMA accepted Well Operations Management Plan (WOMP) for each well covered by this EP<br>All above mudline equipment will be removed following P&A as per Section 572 of the OPGGS Act |

### 2.1.1 Operational Areas (OAs)

The OAs covered in this EP are shown in Figure 2-1 and defined by the coordinates listed in Table 2-2. The MODU will be located within the defined OAs within permit areas WA-541-P, WA-435-P and WA-436-P in Commonwealth waters of Australia. The size of each OA has been reduced to as small an area as possible that still provides a

[1] *Re-entry refers to well intervention of an existing production well*

suitably sized area to successfully appraise any discovery. The closest OA to the Western Australia mainland (Mestrel/Bancroft) is ~123 km north of Port Hedland (Figure 2-1).

The final well locations are yet to be finalised. The process for selecting the final well locations for exploration and appraisal wells includes:

- analysis of existing seismic survey data to select prospects with a high probability of success
- completion of the survey activities described in Section 2.3
- consideration to location of other subsea infrastructure (e.g. telecommunications cable)
- consultation with AMSA regarding potential drilling activities in shipping fairways
- results of the initial exploration wells will inform the quantity, location and objectives of subsequent wells.

Exploration and appraisal wells will be drilled within OAs accepted by NOPSEMA under this EP. Notifications prior to drilling will be issued as detailed in Table 8-4 and Table 8-6.

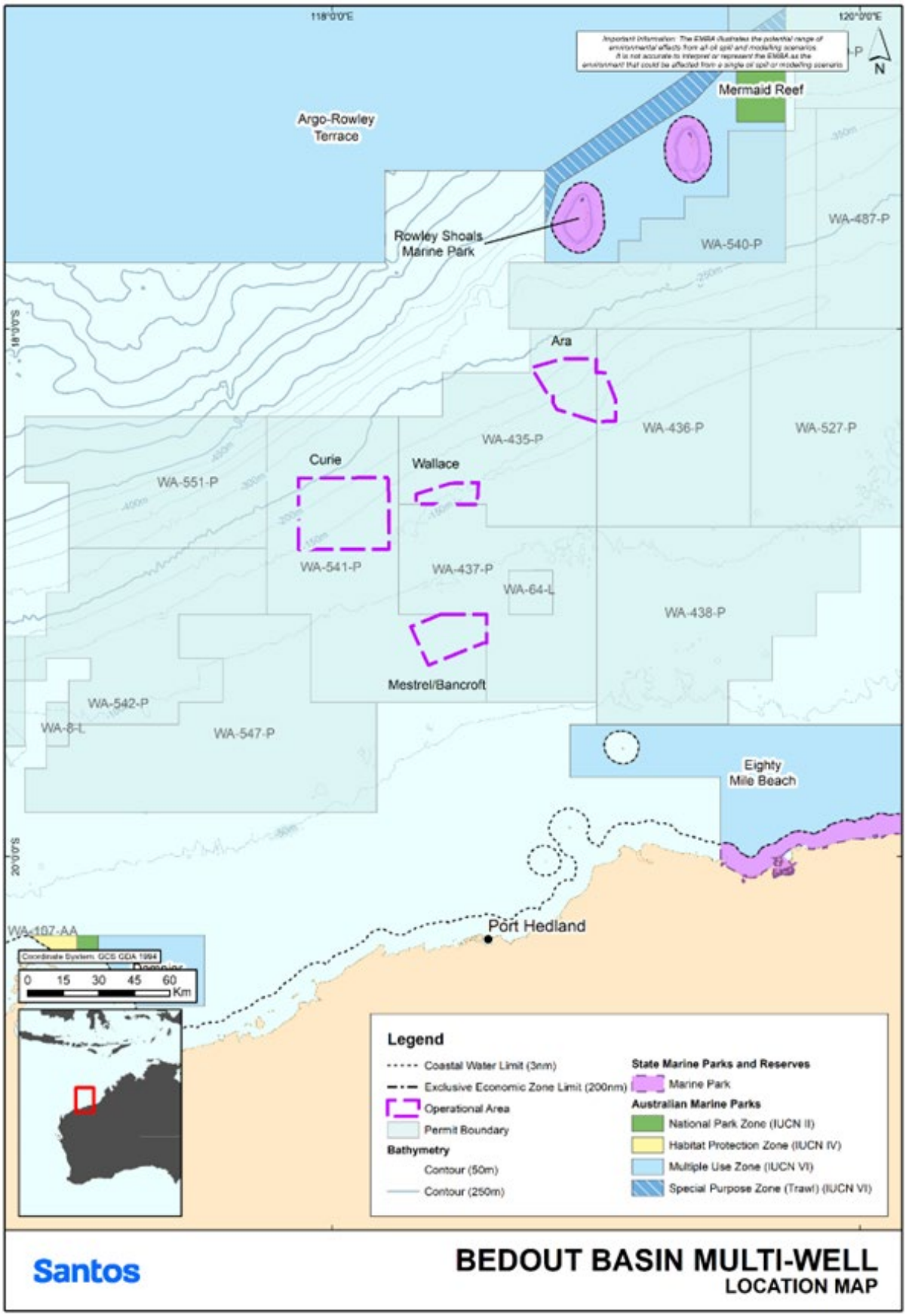



**Figure 2-1: Location of the Bedout Multi-Well Exploration and Appraisal Drilling OAs**

**Table 2-2: Location of the Operational Areas covered in this EP**

| OAs | Lat | Long |
|---|---|---|
| Ara | 18° 06′ 48.37″ S<br>18° 06′ 50.13″ S<br>18° 09′ 57.85″ S<br>18° 09′ 59.04″ S<br>18° 16′ 9.73″ S<br>18° 21′ 1.9″ S<br>18° 21′ 4.72″ S<br>18° 18′ 17.64″ S<br>18° 16′ 48.18″ S<br>18° 14′ 53.53″ S<br>18° 14′ 52.15″ S<br>18° 08′ 50.51″ S<br>18° 06′ 48.37″ S | 118° 52′ 22.75″ E<br>118° 59′ 59.16″ E<br>119° 00′ 0.79″ E<br>119° 02′ 2.23″ E<br>119° 04′ 26.12″ E<br>119° 04′ 24.71″ E<br>119° 00′ 1.11″ E<br>118° 51′ 3.88″ E<br>118° 50′ 10.82″ E<br>118° 50′ 9.08″ E<br>118° 48′ 58.02″ E<br>118° 45′ 16.49″ E<br>118° 52′ 22.75″ E |
| Curie | 18° 33′ 49.88″ S<br>18° 50′ 05.76″ S<br>18° 50′ 12.65″ S<br>18° 33′ 56.66″ S<br>18° 33′ 49.88″ S | 118° 12′ 46.60″ E<br>118° 12′ 53.56″ E<br>117° 52′ 23.61″ E<br>117° 52′ 18.61″ E<br>118° 12′ 46.60″ E |
| Mestrel/Bancroft | 19° 16′ 30.95″ S<br>19° 07′ 44.66″ S<br>19° 11′ 27.76″ S<br>19° 11′ 27.76″ S<br>19° 04′ 55.31″ S<br>19° 04′ 55.32″ S | 118° 21′ 51.47″ E<br>118° 17′ 50.93″ E<br>118° 34′ 17.72″ E<br>118° 35′ 04.54″ E<br>118° 35′ 04.53″ E<br>118° 24′ 39.26″ E |
| Wallace | 18° 39′ 54.5″ S<br>18° 39′ 52.96″ S<br>18° 37′ 35.32″ S<br>18° 35′ 6.28″ S<br>18° 35′ 0.88″ S | 118° 32′ 57.92″ E<br>118° 19′ 4.57″ E<br>118° 19′ 4.33″ E<br>118° 26′ 58.41″ E<br>118° 33′ 17.9″ E |

The relative distances of key islands/mainland from the closest point in the OAs are provided in Table 2-3. The shortest distance is shown to ensure conservatism in the impact assessment of the EP, although it is unlikely the activities will be conducted in close proximity to the OA boundaries.

Water depths across the OAs range from ~80–265 m deep.

**Table 2-3: Distances of Key Islands/Mainland from the Operational Areas**

| Islands / Mainland | Relative Distance From The OAs | | | |
|---|---|---|---|---|
| | Curie | Ara | Mestrel/Bancroft | Wallace |
| Bedout Island Nature Reserve | 118 km | 135 km | 65 km | 110 km |
| De Grey River-mouth | 155 km | 178 km | 101 km | 155 km |
| Eighty Mile Beach | 205 km | 192 km | 150 km | 179 km |
| Port Hedland | 168 km | 225 km | 123 km | 183 km |
| Imperieuse Reef | 120 km | 50 km | 156 km | 107 km |
| Karratha | 236 km | 340 km | 227 km | 275 km |
| Broome | 430 km | 336 km | 404 km | 388 km |

All MODU, vessel and helicopter activities within the OAs are considered part of the activity. Activities outside of the OAs are not part of the activity. These activities will be managed in accordance with applicable jurisdictional legislation.

### 2.1.2 Exclusion and Cautionary Zone

Within the OAs, activities will be undertaken over smaller areas within the MODU exclusion zone. The exclusion zone is defined as a 500 m radius zone around the MODU surface location. Only one MODU will be operating within an exclusion zone at any point in time; however, multiple support vessels and helicopters may be operating in the same area at any one time.

A cautionary zone will be established around each well within the OAs. Each drilling area will be represented by an ~2,000 m radius cautionary zone around the well site, while the MODU is moored on location. This radius encompasses the outer extent of mooring equipment and the 500 m exclusion zone. The cautionary zone represents the area within which other marine users may be displaced while the moored MODU is on location. A 2,000 m cautionary zone will only be in place during anchor handling operations (for 2–3 days either side of rig arrival and departure).

### 2.1.3 Timing and Duration

Activities are scheduled to commence in Q3 2026 subject to obtaining all regulatory and business approvals. The timing of subsequent activities has not been finalised. This EP assumes the activities may be undertaken at any time of year over the five-year validity of this EP.

- Scheduling of drilling will use the following logic:
- a maximum of seven (7) exploration or appraisal wells will be drilled.
- drilling campaigns are expected to consist of between two and four wells each.
- two drilling campaigns are anticipated; however, a third campaign may be required if a jack-up is utilised for the Mestrel / Bancroft prospect.
- drilling campaigns are typically a minimum of 12 months apart to allow for evaluation of acquired well data.
- results of the initial exploration wells will inform the quantity, location and objectives of subsequent wells.

There may be more than one exploration well drilled in an OA. In addition, if an exploration well is successful, an appraisal well is anticipated to be drilled on the successful prospect 6–18 months after the exploration well drilling. Up to four appraisal wells may therefore be drilled following the exploration drilling.

For a typical exploration or appraisal well, the activity duration is expected to be between ~40–110 days of continuous well operations (24 hours per day, seven days per week) which includes rig activities (e.g. placement), drilling and well evaluation and permanent abandonment. The large duration range is linked to the depth, complexity and the well evaluation programme.

It is possible that the activity timing and duration may change due to project requirements, MODU/vessel availability, weather and unforeseen circumstances (e.g. technical difficulties, equipment failures, supply chain etc.). It is envisaged that well activities will be conducted over multiple campaigns, i.e. a MODU arriving to drill one or more wells in a period between two and six months, after which the MODU leaves the OA. Although unlikely, two MODUs (one semi-submersible, one jack up MODU) may be operating in separate OAs at any one time.

Site survey activities (Section 2.3) are expected to be completed in approximately one to two weeks per well location, pending weather, operational requirements etc, prior to MODU arrival for each campaign.

## 2.2 Equipment Spread

### 2.2.1 Mobile Offshore Drilling Unit (MODU)

The OAs have water depths ranging from 80–265 m. Typically, jack-up MODUs are suitable for water depths up to ~110 m (pending soil and leg constraints), and a semi-submersible MODU in deeper water. Under this EP, Mestrel/Bancroft could be drilled with either a jack-up or semi-submersible MODU, whereas the Ara, Curie and Wallace prospects are expected to be drilled using a semi-submersible MODU.

If using a semi-submersible, the MODU will be towed into position at each well location by one or more support vessels. Before laying moorings to hold the MODU in position, an ROV may inspect the seabed conditions (as described in Section 2.2.4). If required by the MODU mooring analysis, some or all of the moorings may be installed before the MODU is mobilised to the OA.

The MODU will be towed into the OA, where it will be connected to pre-laid moorings (if any) and deploy additional moorings (if required) in accordance with the MODU mooring analysis. Anchors will be retrieved upon completion of the activity; they may be recovered with MODU in situ or by support vessels after the MODU has departed.

If using a jack-up, the MODU will be towed into position at each well location by one or more support vessels. When in position, the legs are jacked down to the seabed. Once at the desired location and with the MODU

stationary, the legs are lowered to be fully in contact with the seabed (rig becomes 'pinned'). The MODU then self-elevates out of the water and above maximum expected sea conditions to commence drilling operations. Once drilling has occurred, the legs will be jacked down and the jack-up MODU will be towed off location. A jetting system may be used to free the jack-up legs during demobilisation and prior to the MODU being jacked down and demobilised.

The MODU will be fitted with various equipment to support operations, including:

- power generation systems
- diesel storage
- cooling water and freshwater systems
- drainage, effluent and waste systems
- cementing systems
- solids control equipment used to separate cuttings and drilling fluids (e.g. shale shakers, centrifuges and cuttings driers).

Vessel to MODU refuelling will occur in the OAs during the activities.

### 2.2.2 Support Vessels

Typically, two support vessels will be required to assist the MODU; however, up to four may be present in the OAs (used for towing, anchoring operations, equipment and material transfers, stand-by operations and emergency response). The support vessels are yet to be confirmed but are typically offshore multiple purpose or anchor handling vessels. A support vessel may also perform guard duty for any drilling activity (including survey activities) that may take place in a shipping fairway (Section 3.2.7.8).

Equipment and material transfers may include, but are not limited to:

- crew supplies
- hydrocarbons (diesel, engine oil, hydraulic fluids, grease, etc)
- bulk drilling products
- MODU and drilling equipment and waste.
- MODU cranes will be used for transfers between the MODU and support vessels.

Bulk products will also be transferred via hose from the support vessels and the MODU. Such products include:

- drilling fluids and solids
- brine
- drilling water
- cement
- base oil
- fuel oil (diesel).

At least one support vessel will remain available on stand-by to the MODU within the distance defined in the applicable Safety Case (nominally three nautical miles).

Support vessels are not expected to refuel or anchor in the OAs.

### 2.2.3 Helicopters

Helicopters will be used primarily for crew change and med-evac, and occasionally equipment and material transfers. Helicopter flights will occur approximately three to five times per week, dependent on the progress of the drilling program and logistical constraints. This quantity may increase during contingency operations or in case of emergency evacuation procedures.

### 2.2.4 Remotely Operated Vehicle (ROV)

A work-class ROV will be available on location, to support MODU operations. This support may include:

- conduct visual site surveys
- monitor drilling operations

- conduct periodic visual surveys of subsea equipment
- any required manipulation of subsea equipment.

The ROV may also be operated from a support vessel or MODU.

ROVs are typically 3 m long and 2 m wide, however the class and size of the ROV are dependent on the operational objectives of the survey/activity.

## 2.3 Survey Activities

A number of surveys including geophysical, hydrographic and geotechnical may be required prior to MODU arrival within the OAs for each campaign. These surveys are undertaken utilising a survey vessel and provide information to allow the safe placement of the MODU. The suite of surveys will typically occur within a duration of 1–2 weeks at each well location and within an area of ~5 × 5 km.

### 2.3.1 Geophysical Surveys

Geophysical surveys are typically conducted to investigate pre-identified key areas of interest, such as drilling sites. The survey delineates seabed features which may present a hazard to the placement of the MODU. Types of instrumentation and survey specifics that may be conducted are provided below.

#### 2.3.1.1 Magnetometer

Magnetometer use is part of electromagnetic surveys which are conducted to establish whether there are any buried metallic objects that may pose a risk to MODU placement (e.g. buried infrastructure or cables) and methane hydrate detection. Magnetometers are towed behind a vessel, or are mounted on an AUV or vessel hull, and measure magnetic field strength.

#### 2.3.1.2 Side-scan Sonar

Side-scan sonar (SSS) identifies any sea floor debris which may cause damage to MODU support legs or other equipment. SSS involves towing a set of transducers mounted on either side of a ‘tow fish’ ~10–20 m above the seabed, producing pulses at high frequencies.

#### 2.3.1.3 Sub-bottom Profiler

Sub-bottom profiling (SBP) allows the near-seabed stratigraphy to be evaluated for hazards (including shallow gas, lateral variability in layer properties, adverse near-seabed stratigraphy, anomalous layers of hard/soft formations, localised/regional outcrops or sub-crops, mobile bedforms) and to confirm it will be providing adequate foundations for supporting a jack-up MODU when it is elevated above the water; or anchors and other equipment. SBP utilises an acoustic source typically towed just behind the vessel, with a hydrophone towed ~25 m behind the vessel to record the reflected sound waves.

### 2.3.2 Hydrographic Surveys

Hydrographic surveys are conducted to measure the physical features underwater. Types of instrumentation and survey specifics that may be conducted are provided below.

#### 2.3.2.1 Multibeam Echo Sounder

Multibeam echo sounder (MBES) use enables the collection of bathymetry data and the correlation of depth information. This instrumentation uses a sonar system to transmit short pulses of sound energy, analysing the return signal from the seafloor or other objects.

#### 2.3.2.2 Single Beam Echo Sounder

Single beam echo sounder (SBES) provide water depths by measuring the two-way travel time of a high frequency pulse emitted by a transducer. The systems are calibrated to allow for errors introduced by temperature and salinity and other factors that affect sound velocity. The choice of echosounder depends on many factors including accuracy requirements, depth of water and resolution.

### 2.3.3 Geotechnical Surveys

Geotechnical surveys (seabed sampling) may be required for a range of operational objectives, such as gaining a detailed geotechnical evaluation of the foundation soils for safe placement of jack-up MODU legs.

Surveys may include a number of sites for sample collection; however, the footprint of disturbance will be localised around each respective sampling location related to the placement of equipment. Examples of the equipment used to undertake sampling are provided below.

#### 2.3.3.1 Seabed Mounted Drilling Rig

Seabed mounted drilling rigs are lowered from the vessel to the seabed, to remotely undertake drilling operations.

Placement and elevation of the rig's baseplate on the seabed is monitored and stabilised with the aid of the dynamically positioned (DP) vessel. The primary coring methods used for sampling from subsea mounted drilling rigs are either hydraulic profiling tool (HPT) or rotary coring.

- HPT sampling is generally undertaken wherever possible in un-cemented sediments. For HPT sampling, sediment coring barrels are loaded from the magazine into the chuck. Sufficient drill rods are then made up behind the barrel until the bottom of the hole is reached, or the system is unable to penetrate any further. The drill string and coring barrels are returned to the magazine prior to recovery.
- Rotary coring is generally undertaken in consolidated sediments where the HPT sampling cannot penetrate the substrate. The rotary coring process is much the same as the HPT process with the exception that the mechanical motion is a rotary motion.

#### 2.3.3.2 Shallow Geotechnical Site Survey

Geotechnical site surveys are conducted to establish the geotechnical properties of the shallow soils to ~40 m below seabed. This data provides information for jack-up MODU spud-can penetration assessments and foundation design. A variety of vessel deployed equipment may be used for these surveys, as described below.

**Vibrocoring**

Vibrocoring is undertaken to provide information regarding shallow soils down to a maximum depth of 6 m. The vibrocoring unit is lowered to the seabed on a lifting line. An umbilical is also lowered with the vibrocore. Once on the seabed, electrical power is supplied to the vibrating head through the umbilical. The head then vibrates the core down through the sediment layers.

**Cone penetration tests**

Cone penetration tests (CPTs) are used to provide in-situ detail on the geotechnical characteristics of the soil. CPTs can be deployed as standalone units or used to gather down-hole information during geotechnical drilling.

The unit is lowered to the seabed and a rod is then pushed into the seabed using hydraulically powered turning wheels. The tip of the rod is fitted with a sensitive cone to measure soil resistivity and pore pressure. It can also be fitted to the seafloor using tripods.

**Geotechnical grab sampling**

Sediment/grab samples are used to provide detailed geotechnical data for surface sediments only. A Van Veen system or similar is typically used for shallow water operations. The Van Veen system consists of a clamshell bucket made from stainless steel. The Van Veen is set up on deck prior to being lowered to the seafloor where it is triggered, and a sediment sample collected. It is then recovered to deck where the sample is sub-sampled as appropriate.

Deeper water operations may require a larger grab sample such as a box corer. Large grab samples may be deployed by a hydraulic winch or a crane system from a vessel, smaller samples may be deployed by hand or by a capstan.

## 2.4 Drilling Activities

### 2.4.1 Drilling Phases

The planned drilling activities are expected to consist of:

- optional pre-mobilisation survey and pre-lay of moorings before moving the MODU to the OAs (if a semi-submersible MODU is used)
- move the MODU to location and position MODU
- pre-load and jack-up to operational elevation (if jack-up is used)
- drill conductor hole, run and cement conductor
- drill surface hole section

- run and cement surface casing
- install wellhead and BOP
- pressure test BOP
- drill intermediate hole section(s)
- run well evaluation program (wireline logging, cores, vertical acoustic profiling) (if required)
- run and cement intermediate strings
- drill production section(s) to well total depth (TD)
- run well evaluation program (wireline logging, cores, vertical acoustic profiling, well testing)plug and abandon the well
- demobilise the MODU or move MODU to commence drilling of another well in another OA.

### 2.4.2 Move in and Rig Up (MIRU)

The MODU will be towed into position over the well location using support vessel(s).

If a jack-up is used, the MODU is moved into position with the legs jacked up, to avoid contact with the seabed.

Once at the desired location (with the MODU stationary), the legs are lowered to be fully in contact with the seabed. The MODU then raises itself ~1 m above the sea level and pre-loading is conducted (this verifies that the seabed will provide adequate foundation to support the MODU). The MODU then raises itself to ~35 m above the sea surface, and the cantilever will be skidded out and final preparations for drilling.

If a semi-submersible is used, when the MODU is in position, an anchor handling vessel run out and set the MODU's anchors (or connect MODU lines to pre-laid anchors) which then hold the MODU in position over the well location. During anchoring operations, anchor chains may intermittently drag across the seabed. Once in the desired position, the MODU will then ballast down to drilling draft (increased draft for additional stability) using its in-built ballast control system and prepares to commence drilling operations.

### 2.4.3 Drilling Fluids

Water-based mud (WBM) will be used for drilling activities.

The conductor and surface hole sections (or intervals) will be drilled using seawater and pre-hydrated gel sweeps to clean the hole. This drilling fluid will exit the well at seabed while drilling the hole to install the conductor/surface casing. If a jack-up is used, returns may be at the sea surface.

Once the surface casing is installed, thereby establishing a closed circulating system, the remainder of the well will be drilled with a weighted brine/shale-inhibited WBM. The WBM will be discharged from the MODU at sea surface either on cuttings (see Section 2.4.5) or from surface storage tanks/mud pits when no longer required.

Aqueous-based Lost Circulation Materials (LCM) will be available to pump, should downhole losses occur.

Base oil may be utilised for wells where a well test is required to be performed; however, no base oil is planned to be discharged to the environment.

All drilling chemicals will be assessed in accordance with Santos' chemical selection requirements (Section 2.5), which considers the environmental impacts of drilling fluids. Estimated volumes of drilling and completion fluids discharged to the marine environment per well are provided in Table 2-4. Given there are different well designs possible in the different OAs, a high and low side estimate is presented below to bound the discharge volumes on a per well basis.

**Table 2-4: Estimated discharge of drilling fluids per well**

| Drilling Fluid | Estimated Discharge Volume | Notes |
|---|---|---|
| Seawater/gel sweeps | Low Case: 1,900 $m^3$<br>High Case: 3,500 $m^3$ | • Discharged at or near the seabed.<br>• Estimate based on riserless conductor and surface intervals.<br>• Allowances have not been made for contingency side-tracks or re-drills. |
| WBM | Low Case: 900 $m^3$<br>High Case: 2,500 $m^3$ | • Discharged at the sea surface.<br>• Estimate based on intermediate and production and reservoir intervals. |

| Drilling Fluid | Estimated Discharge Volume | Notes |
|---|---|---|
| | | • Allowances have not been made for contingency side-tracks or re-drills. |
| Brine | Low Case: 450 $m^3$<br>High Case: 800 $m^3$ | • Brine used to build WBM or completion brine for well testing. |

### 2.4.4 Drilling Chemicals

Chemicals required for drilling operations include, but are not limited to, brines, acids, weighting materials, water-soluble polymers, pH controllers, alkalinity controllers, defoamers, detergents and contingency LCM, as well as cement, cement additives and spacers. Tracer dyes may also be used for leak detection and cementing operations.

Hydraulic control fluid is used in the work-class ROV and is also used in the subsea BOP system to function different BOP elements. When an element on the subsea BOP is functioned, BOP control fluid (between ~50 and 150 L depending on function) is vented to the marine environment near the seabed.

### 2.4.5 Drilled Solids (Cuttings)

Similar to drilling fluids, cuttings for the conductor hole section will exit the wellbore at the seabed. Cuttings for the surface hole section will exit the well from the conductor at sea-level.

Cuttings for the remaining downhole sections to TD will be discharged at sea level after being removed from the WBM system through the MODU's solids control system. The solids control system comprises shale shakers and, if required, to remove ultra-fine solids in the recovered drilling fluid, centrifuges. Estimated cuttings volumes are provided in Table 2-5. Given there are different well designs possible in the different OAs, a high and low side estimate is presented below to bound the discharge volumes on a per well basis.

**Table 2-5: Estimated discharges of drill cuttings per well**

| Cuttings | Estimated Discharge Volume | Notes |
|---|---|---|
| Conductor and surface sections | Low Case: 300 $m^3$<br>High Case: 1,000 $m^3$ | • Discharged to the seabed during riserless drilling (may be sea surface depending on jack-up configuration of conductor)<br>• Allowances have not been made for contingency side-tracks or re-drills. However, the estimated discharge volumes would be similar if a side-track or re-drill was required. |
| WBM cuttings from intermediate and production sections | Low Case: 150 $m^3$<br>High Case: 650 $m^3$ | • Discharged at sea surface while drilling with riser in place after treatment with solids control equipment.<br>• Allowances have not been made for contingency side-tracks or re-drills. However, the estimated discharge volumes would be similar if a side-track or re-drill was required. |

### 2.4.6 Cement Operations

Primary cement jobs are planned for cementing the conductor, surface casing and intermediate casing strings in place. These cement jobs will provide a structural base for the well and are critical to well integrity. The majority of cement pumped remains downhole, but minor volumes may be discharged at the seabed (e.g. when cementing conductor) or at surface (when flushing lines or tanks). Some cement may be mixed and discharged as part of cement unit commissioning prior to the start of a campaign if the cement unit / pump has not been used before or in a considerable period of time.

Abandonment cement plugs are planned to safely plug and abandon the wells. The final abandonment program will ensure moveable hydrocarbons (if identified whilst drilling) are isolated per the NOPSEMA-accepted WOMP.

During cementing operations, surface cementing equipment and lines will need to be flushed, washed and cleaned with water to prevent hard setting. The residual cement and wash water will be discharged to sea after each cement job.

Cement spacer in well returns and residual surface tank volumes will also be discharged to sea during cementing operations. Tracer dyes may be used during cementing operations for detection purposes. Once the well has been completed, or during an emergency (e.g. cyclone avoidance), unmixed bulk drilling fluid solid additives (barite and bentonite), dry cement and brine will be managed in accordance with the decision framework in Table 6-18. Where possible, residual dry bulks will be mixed into a slurry for discharge. However, with dead volumes in silos, it is often not possible to mix the remaining 10–15 MT per silo. In these instances, and where all other options have been exhausted per Table 6-18, then compressed air will be used to vent the dry bulk overboard. The only other

alternative would be to have personnel enter the silo (confined space) and manually remove the bulk, which presents an increased risk to personnel safety.

Estimated volumes of cement discharge, including contingencies for failed cement jobs, are provided in Table 2-6.

**Table 2-6: Estimated discharge volumes of cement during drilling per well**

| Cement Discharge | Estimated Discharge Volume | Notes |
|---|---|---|
| Conductor cement job | 60 $m^3$ | • Wet cement discharge to seabed around conductor during conductor cement job. |
| MODU wet cement discharges | < 15 $m^3$ | • Wet or set cement discharges to sea (i.e. cement spacer, flushing tanks and lines etc.) |
| Off-specification cement | 100-250 $m^3$ | • 100 $m^3$ of cement (wet) discharged at sea surface or 250 $m^3$ at the seabed in the event of a cement job not meeting technical and safety standards |

### 2.4.7 Well Re-spud and Sidetrack Drilling

Up to seven exploration and/or appraisal wells are planned with an allowance for re-spud and sidetrack if necessary. Re-spud is allowed for as a contingency in all wells.

Should drilling difficulties be experienced (i.e. the well cannot progress), contingency options exist to either cement up the existing hole above the trouble zone and sidetrack drill the well around the problem; or, in extreme circumstances, plug and abandon the existing wellbore, and re-drill the well from the seabed surface.

Whilst unlikely, these activities may require additional rig moves within the OAs and would require additional time on location and an increase in the excavated rock volume (e.g. cuttings), drilling fluids and cement consumed / discharged compared to the planned activity.

A re-spud and/or sidetrack drilling would only be exercised should drilling difficulties be experienced and is not considered a new stage of the activity. If required, a re-spud would be within 1 km of the initial well location, but most likely within 50 m.

### 2.4.8 Well Evaluation

Well evaluation involves the collection of data on the well and surrounding formation. Downhole formation evaluation will be performed which may include wireline logging (including potential radioactive sources downhole), Vertical Acoustic Profiling (VAP) and cutting of core.

Well testing may also occur to ascertain the pressure, flow characteristics and composition of the reservoir fluids. During well testing, hydrocarbons (oil and/or gas) and potentially formation water will be produced from the reservoir. All hydrocarbons will be flared (combusted) using burners or contained within appropriate sampling bottles or tanks. A well test duration is typically two to five days (flare duration is typically <24–48hours), and multiple well tests are possible on different zones within a single well. Not all wells will have a well test performed and for the purposes of this EP it is assumed that testing will occur on appraisal wells. This would be 3–4 wells.

Marine discharges typically occur during well testing, such as treated recovered formation water and brine, and cooling (deluge) water. Any water recovered will be treated to remove oil prior to being discharged to the marine environment so that the oil in water content is <1% by volume prior to discharge. A steam heat exchanger may be used in well testing and this results in heated water (i.e. fresh or seawater) being discharged to the marine environment.

At the end of the well test, the well is secured, and the process and handling facility rigged down and demobilised.

### 2.4.9 Abandonment

At the end of drilling and evaluation activities, the wells will be permanently abandoned in accordance with the requirements of the NOPSEMA-accepted WOMP. Permanent abandonment is performed by setting and verifying appropriate permanent barriers in the well (including cement plugs). The casings and wellhead will be removed below or at the seabed and recovered, leaving the seabed clear in accordance with Section 572 of the OPGGS Act.

### 2.4.10 Cyclone Response

Standard well suspension equipment will be available offshore to safely install temporary barriers should the MODU require emergency evacuation. In the event the MODU is down-manned for a cyclone, the well will be suspended with appropriate downhole barriers to flow. The integrity of these barriers will be independent of any

cyclonic metocean conditions and is compliant with the NOPSEMA-accepted WOMP for the activity where the plan for well suspension in the event of a cyclone is assessed.

### 2.4.11 Logistics and Support Activities

Vessel to MODU refuelling in the OAs will occur during the activity. In-water refuelling of support vessels will not take place within the OAs. Offshore refuelling of the helicopters whilst onboard the MODU is not planned, however, may be undertaken if required.

Helicopters will be used to transfer crew and equipment, and assist in Health, Safety, Environment (HSE) or operational emergencies as required. During the activity, ROV surveys may be completed from the support vessels (or the MODU) within the OAs. In the event of an emergency, fire-fighting systems will be available on vessels and the MODU which may include aqueous film forming foam (AFFF). Routine and contingency testing of the systems and the AFFF may be undertaken as it is critical for emergency response preparedness. Any AFFF used will be PFAS free.

### 2.4.12 End of Activity

The activity ends once all wells have been plugged and abandoned in accordance with the requirements of the NOPSEMA-accepted WOMP; and the MODU and all support vessels have departed the OAs. The subsea wellhead will be removed and all anchors (MODU, pre-lay or stand-by vessel mooring) will be recovered. No equipment will be left above the seabed.

## 2.5 Chemical Assessment

A risk-based approach to select chemical products ranked under the Offshore Chemical Notification Scheme (OCNS) is applied for those chemicals used and discharged to the marine environment. This scheme lists and ranks all chemicals used in the exploration, exploitation, and associated offshore processing of petroleum on the UK Continental Shelf.

Chemicals are ranked according to their calculated Hazard Quotients (HQ) by the CHARM (Chemical Hazard Assessment and Risk Management) mathematical model, which uses aquatic toxicity, biodegradation and bioaccumulation data. The HQ is converted to a colour banding with Gold and Silver colour bands representing the least environmentally hazardous chemicals. Chemicals not amenable to the CHARM model (in other words, inorganic substances, hydraulic fluids or chemicals used only in pipelines) are assigned an OCNS grouping based on the worst-case ecotoxicity data with Group E and D representing the least hazard potential.

The *Santos Operations Chemical Selection, Evaluation and Approval Procedure* accepts CHARM ranked Gold / Silver, or non-CHARM ranked E/D chemicals for use and discharge without a detailed environmental risk assessment. The same applies to chemicals that are OSPAR Pose Little or No Risk to the Environment (PLONOR) List. The PLONOR Listed, agreed upon by the OSPAR Convention (Convention for the Protection of the Marine Environment of the North-East Atlantic), contains a list of substances that will pose little or no risk to the environment in offshore waters. If chemicals are ranked lower than Gold, Silver, E or D (in other words, CHARM ranked purple, orange, blue or white, or non-CHARM A, B or C ranked chemicals) and no alternatives are available, a risk assessment is conducted providing technical justification for their use and showing that their use and associated risk is acceptable and ALARP.

As described above, investigation of potential alternative chemicals are completed when chemicals are ranked lower than CHARM Gold, Silver, E or D (in other words, CHARM ranked purple, orange, blue or white, or non-CHARM A, B or C ranked chemicals). There is a preference for chemical options that are CHARM ranked Gold/Silver, or non-CHARM ranked E/D chemicals and/or chemical that have a low aquatic toxicity, are readily biodegradable and do not bioaccumulate (discussed below).

Any chemicals that may be discharged to the marine environment and are not OCNS CHARM or non-CHARM ranked, are risk assessed using the OCNS CHARM or non-CHARM models. The chemical is assigned a pseudo-ranking based on the available aquatic toxicity, biodegradation and bioaccumulation data (discussed below) and assessed for environmental acceptability for discharge to the marine environment.

### 2.5.1 Ecotoxicity Assessment

Table 2-7 and Table 2-8: act as guidance in assessing the ecotoxicity of chemicals during the investigation of potential alternatives. Table 2-8: is used by Cefas to group a chemical based on ecotoxicity results. ‘A’ represents the highest toxicity/risk to environment and ‘E’ represents the lowest. Table 2-8: shows classifications/categories of toxicity against aquatic toxicity results.

**Table 2-7: Initial OCNS grouping**

| Initial Grouping | A | B | C | D | E |
|---|---|---|---|---|---|
| Result for aquatic-toxicity data (ppm)[2] | <1 | ≥1–10 | >10–100 | >100–1,000 | >1,000 |
| Result for sediment-toxicity data (ppm) | <10 | ≥10–100 | >100–1,000 | >1,000–10,000 | >10,000 |

*Source: Cefas Standard Procedure 2019, OCNS 011 NL Protocol PART 1: Core Elements*

**Table 2-8: Aquatic species toxicity grouping**

| Category | Species | $LC_{50}$ and $EC_{50}$ criteria |
|---|---|---|
| Category Acute 1: Hazard statement – Very toxic to aquatic life | Fish | $LC_{50}$ (96 hrs) of ≤1 mg/L |
| | Crustacea | $EC_{50}$ (48 hrs) of ≤1 mg/L |
| | Algae/other aquatic plant species | $ErC_{50}$ (72 or 96 hrs) of ≤1 mg/L |
| Category Acute 2: Hazard statement – Toxic to aquatic life | Fish | $LC_{50}$ (96 hrs) of >1 mg/L to ≤10 mg/L |
| | Crustacea | $EC_{50}$ (48 hrs) of >1 mg/L to ≤10 mg/L |
| | Algae/other aquatic plant species | $ErC_{50}$ (72 or 96 hrs) of >1 mg/L to ≤10 mg/L |
| Category Acute 3: Hazard statement – Harmful to aquatic life | Fish | $LC_{50}$ (96 hrs) of >10 mg/L to ≤100 mg/L |
| | Crustacea | $EC_{50}$ (48 hrs) of >10 mg/L to ≤100 mg/L |
| | Algae/other aquatic plant species | $ErC_{50}$ (72 or 96 hrs) of >10 mg/L to ≤100 mg/L |

** Source: United Nations (2021). Globally harmonized system of classification and labelling of chemicals (GHS) (Report No. ST/SG/AC.10/30/Rev.9). United Nations, New York.*

### 2.5.2 Biodegradation Assessment

The biodegradation of chemicals is assessed using the Centre for Environment, Fisheries and Aquaculture Science (Cefas) biodegradation criteria, which aligns with the categorisation outlined in the *United Nations GHS Annex 9 Guidance on Hazards to the Aquatic Environment* (2019). The below is used as a guide during the investigation of potential chemical alternatives. Preference is to select readily biodegradable chemicals.

Cefas categorises biodegradation into the following groups:

- readily biodegradable: results of >X% biodegradation in 28 days to an OSPAR harmonised offshore chemical notification format (HOCNF) accepted ready biodegradation protocol.
- moderately biodegradable: results >20% and <X% to an OSPAR HOCNF accepted ready biodegradation protocol.
- poorly biodegradable: results from OSPAR HOCNF accepted ready biodegradation protocol
- where X is equal to:
  - 60% in 28 days in OECD 306, marine biodegradability of insoluble substances or any other acceptable marine protocols, or in the absence of valid results for such tests
  - 60% in 28 days (OECD 301B, 301C, 301D, 301F, Freshwater biodegradability of insoluble substances), OR
  - 70% in 28 days (OECD 301A, 301E).

### 2.5.3 Bioaccumulation Assessment

The bioaccumulation of chemicals is assessed using the Cefas bioaccumulation criteria, which aligns with the categorisation outlined in the Annex 9 of the *Globally harmonized system of classification and labelling of chemicals* (GHS) (United Nations, 2021). Preference is to select non bio accumulative chemicals.

[2] *Note: Aquatic toxicity refers to the Skeletonema costatum EC50, Acartia tonsa LC50, and Scophthalmus maximus (juvenile turbot) LC50 toxicity tests. Sediment toxicity refers to the Corophium volutator LC50 test.*

The following guidance is used by Cefas:

- non-bio accumulative/non-bioaccumulating: Log Pow <3, or results from a bioaccumulation test (preferably using Mytilus edulis) demonstrates a satisfactory rate of uptake and depuration, and the molecular mass is ≥700.
- bio accumulative/Bioaccumulates: Log Pow ≥3, or results from a bioaccumulation test (preferably using Mytilus edulis) demonstrates an unsatisfactory rate of uptake and depuration, and the molecular mass is <700.

All operational chemicals will be selected in accordance with the *Santos Operations Chemical Selection, Evaluation and Approval Procedure* and *Santos Drilling Fluid and Chemical Selection in Drilling Activities Procedure*, as applicable.

# 3. Existing Environment Description

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 21. Environmental assessment** |
| Description of the environment<br>21(2) The environment plan must —<br>c) describe the existing environment that may be affected by the petroleum activity; and<br>d) include details of the particular relevant values and sensitivities (if any) of that environment.<br>Note: The definition of environment in Section 5 includes its social, economic, and cultural features.<br>21(3) Without limiting paragraph (2)(b), particular relevant values and sensitivities may include the following:<br>a) the world heritage values of a declared World Heritage property within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).<br>b) the national heritage values of a National Heritage place within the meaning of that Act.<br>c) the ecological character of a declared Ramsar wetland within the meaning of that Act.<br>d) the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act.<br>e) the presence of a listed migratory species within the meaning of that Act.<br>f) any values and sensitivities that exist in, or in relation to, part or all of:<br>– Commonwealth marine area within the meaning of that Act; or<br>– Commonwealth land within the meaning of that Act |

## 3.1 Environment that May be Affected

This section describes the key physical, biological, socio-economic and cultural characteristics of the environment that may be affected (EMBA) by the Activity (Section 2). The EMBA is the largest spatial extent where the worst-case unplanned event could have a potential environmental consequence.

The description of the environment describes two areas:

- the OAs (the area within which the planned activities will occur), and
- the environment that may be affected (EMBA).

These are shown in Figure 3-1.

A detailed and comprehensive description of the environment (required by OPGGS(E)R 2023, Section 21(2)(3)) in the OAs and the EMBA is provided within Section 3 and Appendix C.

### 3.1.1 Determining the EMBA

In order to determine the EMBA, hydrocarbon dispersion and fate modelling is undertaken on the worst-case unplanned hydrocarbon release, (which for this EP is from a loss of well control event as described in Section 7.5), to identify the potential spatial extent of environment consequence from hydrocarbons at different exposure values and for the various oil phases (Table 3-1).

The oil spill modelling exposure values applied, results in the creation of two EMBAs, defined as the:

- socio-economic EMBA; and
- ecological EMBA.

For this EP, the socio-economic EMBA is the more conservative (larger spatial extent) of the two, and as such has been adopted as the EMBA from unplanned events. In addition to the scientific basis provided in Table 3-1, Section 4 provides consultation feedback as further justification for why it is appropriate to consult on an EMBA using the exposure values as detailed in Table 3-1.

**Socio economic EMBA**

The socio- economic EMBA is

- defined as the potential spatial extent at which socio-economic impacts may occur; and
- has been used to inform stakeholder consultation (Section 4) – note this has formed part of the identification of relevant persons, however, as described in Section 4, this is not the only method used to identify relevant persons.

### Ecological EMBA

The ecological EMBA is defined as the area at which ecological impacts to the marine environment may occur.

The EMBAs for this EP are similar in extent, but the socio-economic EMBA is slightly bigger than the ecological EMBA, therefore has been used for impact assessment (Figure 3-1).

Table 3-1 describes the exposure values used for determining both EMBAs and further detail is provided in Section 7.5.4.

**Table 3-1: Hydrocarbon exposure values of the environment that may be affected**

| | Socio-economic EMBA | Ecological EMBA |
|---|---|---|
| Surface Hydrocarbons<br>(oil that is predicted to be floating on the surface of the water at the time it is mapped. Floating oil may later entrain into the water or go ashore). | 1 g/m$^2$<br>Approximates the range of socio-economic effects (NOPSEMA 2025a). This represents a wider area where a visible sheen may be present on the surface and, therefore, the concentration at which socio-cultural impacts to the visual amenity of the marine environment may occur. | 10 g/m$^2$<br>Approximates the lower limit for harmful exposures to birds and marine mammals (NOPSEMA 2025a) |
| Dissolved Hydrocarbons<br>(the portion of oil that is predicted to have dissolved into seawater. Compounds in oil capable of dissolving are soluble and semi-soluble.) | 10 ppb<br>10 ppb dissolved represents a lower concentration for identifying social, economic and cultural features of the environment that may be affected by dissolved oil and for assessing the potential consequences on these features.<br>Acute toxicity studies (French-McCay 2025; Negri et al. 2021; Bejarano et al. 2017) demonstrate that, the 10 ppb dissolved exposure value is protective of >95% of species for acute exposures. 10 ppb dissolved also represents a conservatively low concentration that can cause toxic effects to sensitive species (French-McCay 2025, Bejarano et al. 2014; McGrath et al. 2018).<br>On the basis that 10 ppb dissolved exposure value can cause potential toxic effects to sensitive species, which can then potentially impact socio-economic values (e.g. impact on fisheries, tourism operations or cultural features), 10 ppb dissolved is considered an appropriate dissolved hydrocarbon exposure value to determine the socio-economic EMBA. | 10 ppb<br>10 ppb dissolved exposure value represents a lower concentration for identifying ecological features of the environment that may be affected by dissolved oil and for assessing the potential consequences on these features.<br>Acute toxicity studies (French-McCay 2025; Negri et al. 2021; Bejarano et al. 2017) demonstrate that, the 10 ppb dissolved exposure value is protective of >95% of species for acute exposures.<br>10 ppb dissolved also represents a lower concentration that can cause toxic effects to sensitive species (French-McCay 2025, Bejarano et al. 2014; McGrath et al. 2018).<br>10 ppb dissolved therefore represents a conservatively low dissolved hydrocarbon exposure value to determine the ecological EMBA. |
| Entrained Hydrocarbons | 1,000 ppb<br>There is a direct scientific relationship between the entrained and dissolved hydrocarbons. The dissolved concentrations derived from oil compounds typically represent about 1% of the oil when fresh, and oil loses the soluble components rapidly as it weathers, therefore the entrained oil threshold should be at least 100 times that for dissolved concentrations (French McCay et al. 2018).<br>Therefore, given toxic effects on sensitive species are established at 10 ppb dissolved, and there is a direct correlation between the dissolved component and entrained components within oil, the entrained oil exposure value should be at least 100 times that for dissolved concentrations (i.e. 1,000 ppb) (French McCay et al. 2018).<br>1,000 ppb entrained represents a lower concentration for identifying social, economic and cultural features of the environment that may be affected by entrained oil and for | 1,000 ppb<br>There is a direct scientific relationship between the entrained and dissolved hydrocarbons. The dissolved concentrations derived from oil compounds typically represent about 1% of the oil when fresh, and oil loses the soluble components rapidly as it weathers. Therefore, given toxic effects on sensitive species are established at 10 ppb dissolved, and there is a direct correlation between the dissolved component and entrained components within oil, the entrained oil exposure value should be at least 100 times that for dissolved concentrations (i.e. 1,000 ppb) (French McCay et al. 2018).<br>1,000 ppb entrained represents a lower concentration for identifying ecological features of the environment that may be affected by entrained oil and for assessing the potential consequences on these features. |

| | Socio-economic EMBA | Ecological EMBA |
|---|---|---|
| | assessing the potential consequences on these features.<br>Dissolved components are more bioavailable, hence evaporate and dissolve, leaving residual (entrained) hydrocarbons with lower potential to cause toxic effects (French-McCay, 2023)<br>Potential for long term exposure to entrained hydrocarbons is low because aquatic organisms' exposures to entrained oil and dissolved components in the water column is limited to typically brief encounters (French-McCay, 2025).<br>While entrained in the water column, the entrained components do not physically concentrate further, rather, entrained hydrocarbons will surface as floating oil and accumulate on the shorelines. Low exposure values for floating oil (1g/$m^2$) and shoreline accumulation (10g/$m^2$) have already been applied in the EMBA development. | Therefore, 1,000 ppb is appropriate for identifying where potential impacts to key sensitive species could occur based on its scientific relationship with dissolved hydrocarbon concentrations. |
| Shoreline accumulation (oil that is predicted to have reached the coastline, including beaches, rocky shores and mangroves) | 10 g/$m^2$<br>Predicts the potential for potential socio-economic impact.<br>10 g/$m^2$ shoreline represents a lower concentration for identifying social, economic and cultural features of the environment that may be affected by shoreline oil, and for assessing the potential consequences on these features. | 100 g/$m^2$<br>Loading predicts area likely to require clean-up response effort (see Section 7.5.4)<br>10g/$m^2$ shoreline represents a lower concentration for identifying ecological features of the environment that may be affected by shoreline oil, and for assessing the potential consequences on these features. |

### 3.1.2 Planning Area for Scientific Monitoring

The planning area for scientific monitoring is the area in which scientific monitoring may be required in the event of a spill and is described further in Section 17 of the OPEP. This scientific monitoring planning area has been set using the planning area for scientific monitoring values outlined in Table 3-2. These are low exposure values as per the NOPSEMA *Application of Oil Spill Modelling in Environment Plans – Information Paper* (NOPSEMA 2025a).

An operational and scientific monitoring program would be activated in the event of any release with the potential to contact sensitive environmental receptors. This is described in further detail in the OPEP (7720-650-EMP-0006) and associated Operational and Scientific Monitoring Bridging Implementation Plan.

**Table 3-2: Hydrocarbon exposure values for the Planning Area for Scientific Monitoring**

| Hydrocarbon fate | Planning Area for Scientific Monitoring |
|---|---|
| Surface Hydrocarbons 1 g/$m^2$ | It represents a lower concentration for defining the planning area for operational and scientific monitoring, within which further analysis can be undertaken to inform monitoring priorities. |
| Dissolved Hydrocarbons 10 ppb | |
| Entrained Hydrocarbons 10 ppb | |
| Shoreline accumulation 10 g/$m^2$ | |

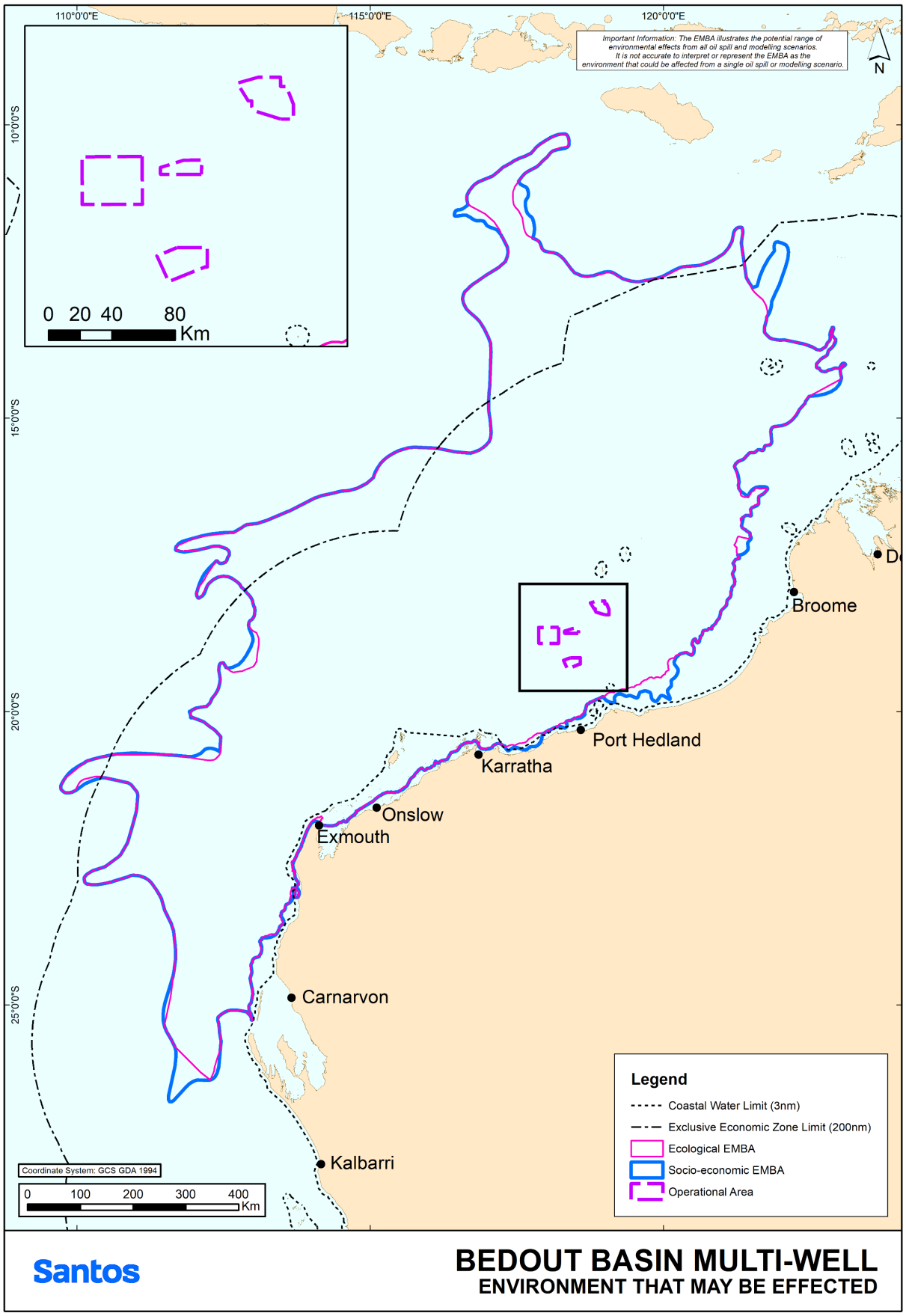



**Figure 3-1: Socio-economic and ecological EMBA**

## 3.2 Environmental Values and Sensitivities

This section summarises environmental values and sensitivities including physical, biological, social, economic and cultural features within the marine and coastal environment that are relevant to the OAs and the EMBA.

A comprehensive description of the environmental values and sensitivities of the existing environment within the OAs and the EMBA is provided for in Appendix C, which provides a compilation of environmental values and sensitivities including physical, biological, social, economic and cultural features within the marine and coastal environment that are relevant to this EP.

### 3.2.1 Protected Matters Search Tool Reports

Database searches of the OAs, and EMBA[3] were undertaken using the Protected Matters Search Tool (PMST) in May 2025. The PMST searches were completed using the same coordinates used to produce the figures presented throughout this section. The socio-economic EMBA (the EMBA) encompasses the full range of environmental receptors that might be contacted by surface and subsurface hydrocarbons at the low exposure level, in the highly unlikely event of a worst-case oil spill. The PMST reports were used to inform the protected and significant areas, as well as the threatened and migratory fauna discussed in this section. The output reports from these searches are provided in Appendix D.

### 3.2.2 Physical Environment

#### 3.2.2.1 Climate

The climate of the OAs and EMBA is arid and tropical, experiencing high summer temperatures and periodic tropical cyclones in summer. Rainfall in the region is low, although intense rainfall may occur during the passage of summer tropical cyclones and thunderstorms. The summer and winter seasons fall into the periods September to March and May to July, respectively. Winters are characterised by clear skies, fine weather, predominantly strong east to south-east winds and infrequent rain. Summer winds are more variable, with strong south-westerlies dominating. Transitional wind periods, during which either pattern may predominate, can be experienced in April, May and September of each year.

Tropical cyclones generate the most significant storm conditions in the area. These clockwise-spiralling storms have generated wind speeds of 50–120 knots. Tropical cyclones passing over the NWS region typically develop in the eastern Indian Ocean, Timor Sea and Arafura Sea during the summer months, with the official cyclone season occurring from November through to April. The OAs fall within the Northwestern sub-region of Australia, classified by the Bureau of Meteorology, where on average five cyclones have been found to either form or pass through annually (Bureau of Meteorology, 2023). However, it should be noted that only approximately three of these five cyclones typically have some form of coastal impact (Bureau of Meteorology, 2023).

#### 3.2.2.2 Bathymetry

The seabed within the OAs is generally considered flat and featureless with water depths between 80 m and 265 m. This is consistent with much of the mid-continental shelf in the NWS region. The Ancient Coastline at 125 m depth bathymetrical feature, considered a key ecological feature (KEF) in the Marine bioregional plan for the North-west Marine Region (DSEWPaC 2012a), is in close proximity to the OAs (7 km south of Ara, 7 km south of Curie, 19 km north of Mestrel/Bancroft, and 11 km south of Wallace), and is described further in Section 3.2.5.3 and Appendix C.

#### 3.2.2.3 Oceanography

Strong tidal flows are typical of the shallow regions of the Northwest Shelf and coastal islands extending from the Dampier Archipelago to the Northwest Cape (RPS 2024). In offshore areas, such as the OAs, where water depths exceed 100 m, large scale drift currents are more dominant and often present as eddies, meandering currents or connecting flows.

In the EMBA, beyond the OAs, mesoscale currents, such as the Holloway and Leeuwin currents, play an important role in water movements. The Holloway Current transports relatively warm, low salinity water from tropical regions along the Northwest Shelf and is the predominant contributor of mass transport at water depths from 100–200 m (Bahmanpour et al. 2016). The Holloway Current is a source of water for the Leeuwin Current which commences around the North West Cape and flows southward along the edge of the continental shelf. The influence of the Leeuwin Current is primarily confined to surface waters <150 m deep (Cresswell 1991). The strength of the Holloway and Leeuwin currents varies seasonally, driven by the El Niño-Southern Oscillation, with maximum flow

[3] *PMST searches were conducted on the socio-economic EMBA, to ensure a conservative approach. The socio-economic EMBA presents the largest spatial extent*

between April and July (Bahmanpour et al. 2016; Pearce and Phillips 1988). The formation of meanders and eddies are a feature of the Leeuwin Current and may advect large masses of water away from the Western Australian coastline into the Indian Ocean (Waite et al. 2007). Northward-flowing wind-driven currents, such as the Ningaloo and Capes currents, may develop during summer months flowing between the Leeuwin Current and the Western Australian coastline (Pattiaratchi and Woo 2009).

#### 3.2.2.4 Water Quality

A water quality survey was undertaken by RPS (2020a) for the Santos Dorado development project and covered areas of the Dorado development (located 15.5 km from the Mestrel/Bancroft OA, 40 km from the Wallace OA, 57 km from the Curie OA and 70 km from the Ara OA). Given the proximity of the OAs to the surveyed area the results are considered representative of the Ara, Wallace, Currie and Mestrel/Bancroft OAs. The survey results are summarised below:

- water quality was considered high, with little evidence of contamination and conditions typical of offshore waters of the Pilbara and North-west Shelf.
- the physiochemical parameters were observed to be typical of offshore waters in the region and stratification of temperature, pH and dissolved oxygen levels is expected.
- thermal stratification was expected to reduce during the winter months with the strong currents contributing to vertical mixing of the water column.
- variation in pH and dissolved oxygen (DO) levels observed were both attributed to water depth and natural processes.
- salinity was observed to be generally consistent year-round with limited evidence of stratification and no clear cross-shelf variation observed.
- turbidity levels in surface waters are low, with higher levels of turbidity generally concentrated at the seabed, considered to be associated with sediment resuspension by currents.
- concentrations of metals (cadmium, chromium, lead, nickel, mercury, cobalt, arsenic, copper, zinc) and hydrocarbons were observed to be generally below the laboratory limit of reporting and/or the Australian and New Zealand Guideline (ANZG 2018) values. Consistent with naturally occurring levels of contaminants recorded in mid-continental shelf waters across the region.
- nutrients were the only analyte group which exceeded the ANZG 2018 guideline values across sampling locations. However, nutrient levels can experience extreme fluctuations driven by natural processes and similar/higher levels have previously been observed across the North-west Shelf.

Water quality within the EMBA is considered comparable with that of the OAs.

#### 3.2.2.5 Sediment Quality

A sediment quality survey was undertaken by RPS (2020b) for the Santos Dorado development project and covered areas of the Dorado development. The results are considered adequate to represent the sediment quality of all the OAs given their proximity to the surveyed area, which covered areas of known oil and gas activity, areas overlapping the ancient coastline at 125 m depth contour KEF, and spanned a number of the ecotypes outlined by Keesing et al. (2020) (see Section 3.2.4). The survey results are summarised below:

- sediment quality observed was considered to be high, with little evidence of contamination.
- sediments ranged from slightly gravelly muddy sand to gravelly sand and rubble, coinciding with water depth, with finer size fractions generally associated with deeper water.
- the concentration of several metals (arsenic, chromium, iron) were found to be correlated with particle size with variation in concentrations attributed to natural heterogeneity. Arsenic was the only metal detected above the ANZG 2018 guideline value; However, elevated arsenic levels are typical of the region and are considered naturally occurring (DEC 2006).
- nutrient concentrations were typical of the region, did not exhibit any clear spatial patterns and while fluctuations were observed, they were considered to be associated with naturally occurring processes.
- hydrocarbons and naturally occurring radioactive materials were not detected above laboratory reporting limits.

#### 3.2.2.6 Air Quality

The OAs are remote from potential sources of atmospheric pollutants, and air quality in the OAs is considered high. Given the closest OA (Mestrel/Bancroft) is 123 km from and the nearest town (Port Hedland), air quality is unlikely to be affected by mainland sources of atmospheric pollution. Vessel traffic is the only known source of atmospheric

pollutants in and around the OAs and there is a relatively high density of commercial shipping traffic in the vicinity of the OAs (see Section 3.2.7.7), primarily bulk iron ore carriers transiting to and from Port Hedland.

### 3.2.2.7 Underwater Acoustic Environment

Ambient underwater acoustic environments, or soundscapes, consist of cumulative contributions from abiotic (geophonic e.g. sea state, wind speed, breaking waves, rainfall, earthquakes, sea ice movements), biotic (biophonic e.g. vocalisations by marine mammals, fish and invertebrates, consequences of behaviour) and man-made (anthrophonic e.g. vessel traffic, construction, oil and gas activity) sound sources (Krause 2008). Underwater noise monitoring undertaken by Lucke et al. (2022) using recorded audio collected across a 105-day period identified the dominant geophonic, biophonic and anthrophonic contributors to the ambient underwater acoustic soundscape. The dominant background geophonic contributor was tidal flow at low frequencies (10–100 Hz). The most dominant biophonic contributor was fish choruses (100-1000 Hz) either showing a strong diurnal pattern, occurring for average of two hours at night or occurring almost continuously with fluctuations following a lunar or seasonal rhythm. Acoustic signals of Omura's whales, killer whales, and dolphins were also detected. Vessels were the dominant anthropogenic contributor to background underwater noise.

## 3.2.3 Bioregions

Based on the *Integrated Marine and Coastal Regionalisation of Australia*, Version 4.0 (CoA, 2006), the regional descriptions relevant to the OAs and the EMBA are provided in Table 3-3, shown in Figure 3-2 and further discussed in Appendix C.

**Table 3-3: Integrated Marine and Coastal Regionalisation of Australia 4.0 provincial bioregions relevant to the Activity**

| Bioregion | OA | | | | EMBA |
|---|---|---|---|---|---|
| | Ara | Curie | Mestrel/ Bancroft | Wallace | |
| **North West Marine Region** | | | | | |
| Northwest Shelf Transition | ✗ | ✗ | ✗ | ✗ | ✓ |
| Timor Province | ✗ | ✗ | ✗ | ✗ | ✓ |
| Northwest Transition | ✓ | ✓ | ✗ | ✗ | ✓ |
| Northwest Province | ✗ | ✗ | ✗ | ✗ | ✓ |
| Northwest Shelf Province | ✓ | ✓ | ✓ | ✓ | ✓ |
| Central Western Transition | ✗ | ✗ | ✗ | ✗ | ✓ |
| Central Western Shelf Transition | ✗ | ✗ | ✗ | ✗ | ✓ |
| Central Western Shelf Province | ✗ | ✗ | ✗ | ✗ | ✓ |
| **South West Marine Region** | | | | | |
| Central Western Province | ✗ | ✗ | ✗ | ✗ | ✓ |
| Southwest Shelf Transition | ✗ | ✗ | ✗ | ✗ | ✓ |

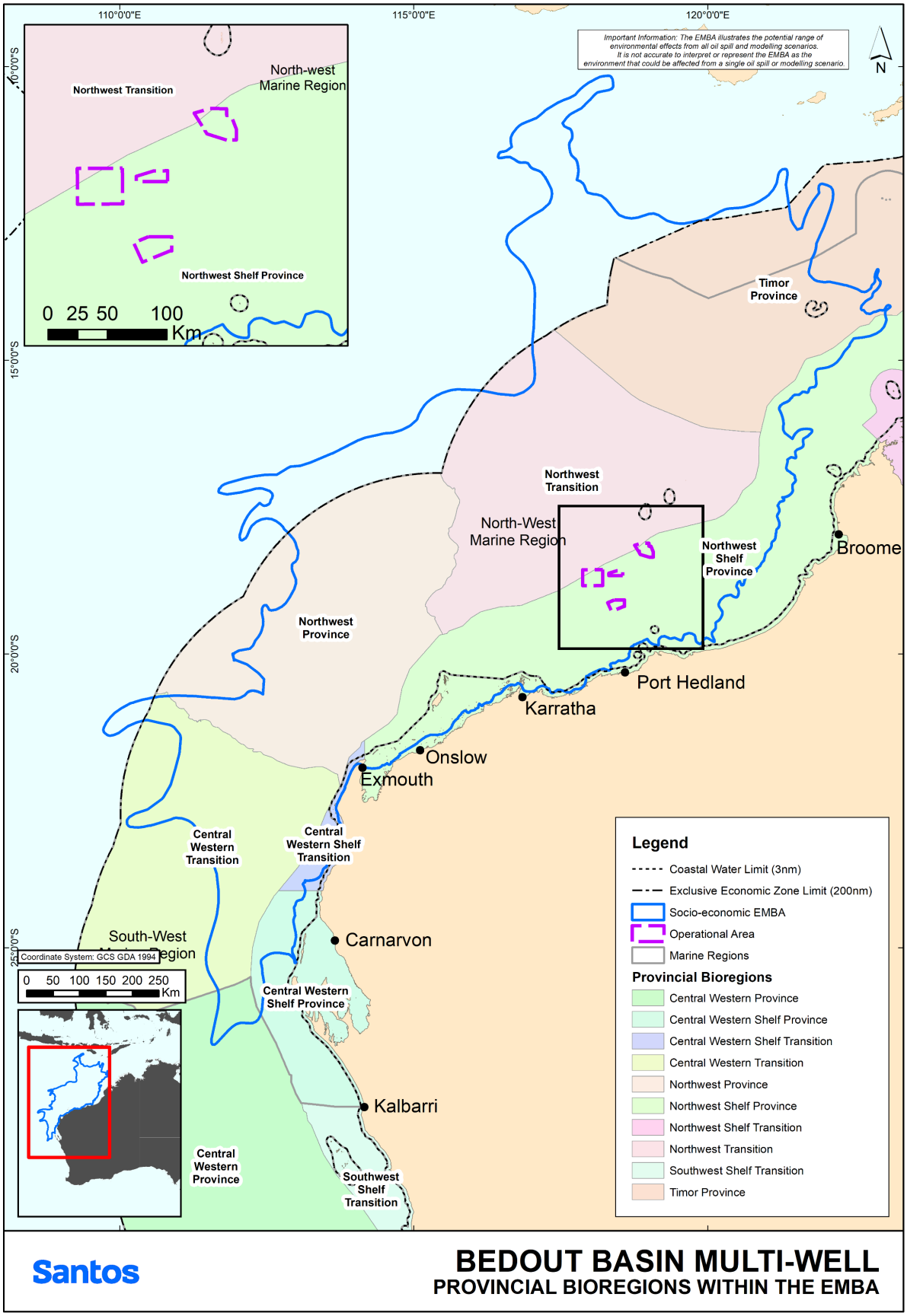



**Figure 3-2: Integrated Marine and Coastal Regionalisation of Australia 4.0 provincial bioregions in relation to the EMBA and OAs**

### 3.2.4 Benthic Habitats

#### 3.2.4.1 Operational Areas

Habitat modelling was conducted by CSIRO (Keesing et al., 2020) for the Santos Dorado development and overlaps the OAs, either wholly or partially. The modelling analysis drew on five historical datasets including fish trawl catch and benthic imagery, remote fish videos, ROV seabed imagery and bathymetry data. The modelling identified seven ecotypes, five of which are considered present within the OAs (Table 3-4 and Figure 3-3). These ecotypes are classified based on both their physical properties (e.g. water temperature, salinity, oxygen, depth) and the biological assemblages present. Benthic habitat in the OAs based on the modelling is considered to be predominantly comprised of soft substrates with filter feeders contributing to a low level of benthic cover; However, scattered patches of diverse and abundant filter feeding habitats are expected, typical of the North-west Shelf and are well represented in the region. No OAs overlap with KEFs, however, the ancient coastline at 125 m depth contour KEF lies ~7 km south of Curie OA at the closest point. Some of the bathymetry associated with the ancient coastline at 125 m depth contour may contribute to a potentially higher benthic cover of habitat forming filter feeders (see Table 3-4). Some hard reef features associated with the ancient coastline at 125 m depth contour KEF may support elevated diversity and species richness in comparison with areas of bare sediment (DSEWPaC 2012a).

There are no coastal habitats (e.g. mangroves), or recognised reefs, shoals or banks within the OAs. The nearest landmass is Bedout Island, located ~65 km south of the nearest OA (Mestrel/Bancroft).

Located in water depths ranging from 80 m – 265 m, the seabed within the OAs is considered to receive insufficient light to support zooxanthellate reef-building corals, seagrass and macroalgae (Gattuso et al., 2006).

**Table 3-4: Summary of the ecotypes in and adjacent to the OAs**

| Ecotype Name | Ecotype Description | Characteristics | Ecotype Presence in OAs |
|---|---|---|---|
| Ecotype 1 | Silty-sand substrate | • water depths >130 m<br>• benthic filter feeder habitats present at very low cover<br>• substrate predominantly bioturbated sediment<br>• filter feeders predominantly non-habitat forming species | Ara<br>Curie<br>Wallace |
| Ecotype 2 | Silty-sand and soft mud substrates | • water depths between 120 m and 130 m<br>• substrate predominantly silty-sand and soft mud<br>• habitat forming filter feeders <5% cover | NA |
| Ecotype 3 | Variable substrates from silty-sand to hard reef with steep depth gradients and topographically complex terrain features | • silty-sand substrate with notable areas of hard, topographically complex reef substrate associated with the ancient coastline at 125 m depth contour KEF<br>• benthic filter feeder habitat contributed to 10–65% benthic cover | NA |
| Ecotype 4 | Variable substrate, predominantly silty-sand or coarse sand but with significant proportions of rubble | • diverse benthic filter feeder habitat contributed to 20–45% benthic cover<br>• some notable areas of soft bottom substrate with abundant non-habitat forming filter feeders | NA |
| Ecotype 5 | Variable substrate ranging from silty-sand to rubble and stones | • flat topography<br>• diverse benthic filter feeder habitat contributed to 30–65% benthic cover | Mestrel/Bancroft |

*Source: Keesing et al. (2020)*

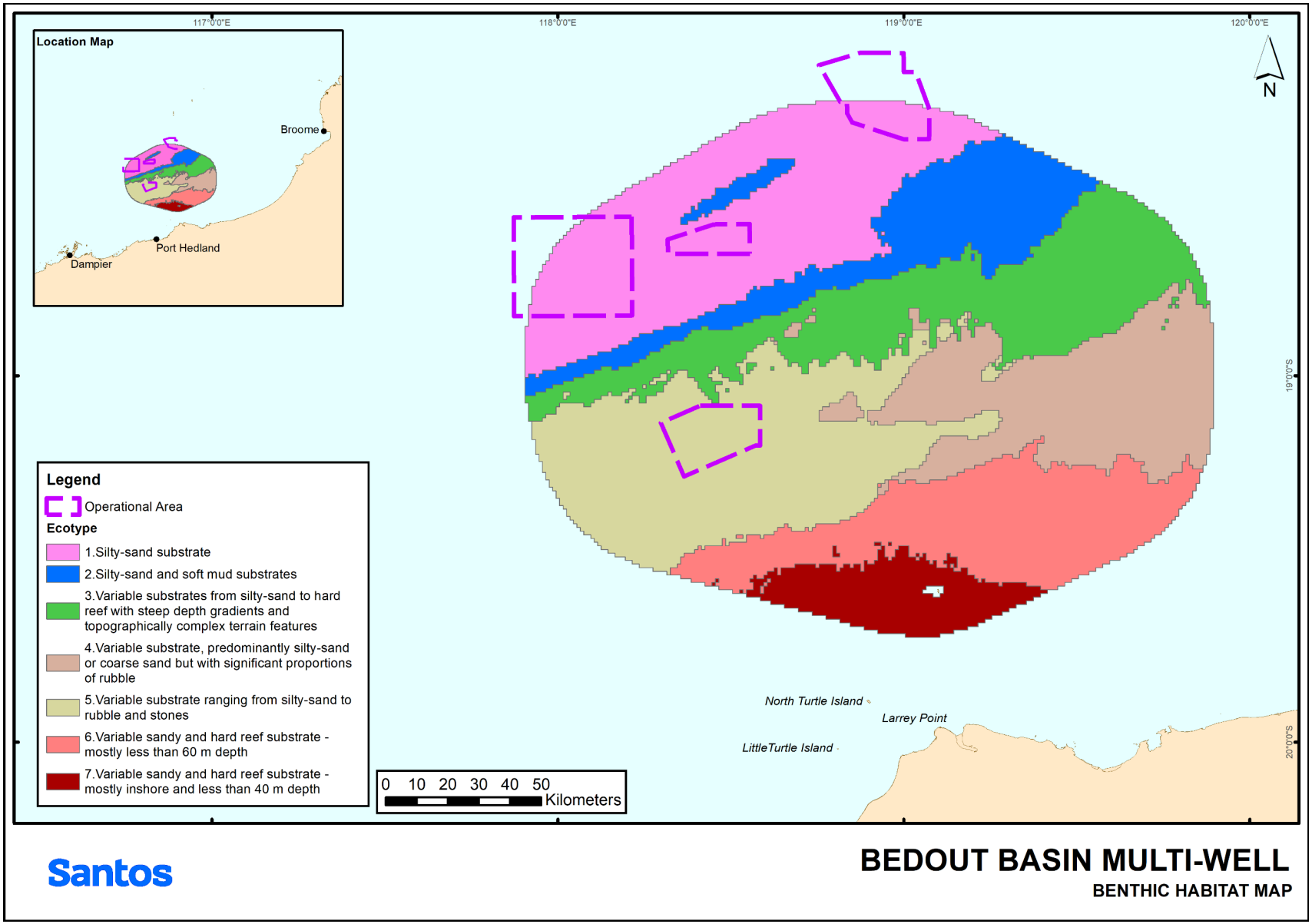



**Figure 3-3: Ecotypes overlapping the OAs based on CSIRO habitat modelling (Keesing et al., 2020)**

### 3.2.4.2 EMBA

While a majority of the benthos within the EMBA is considered to be bare substrate predominantly consisting of silty-sand or coarse sand, there are regions within the EMBA containing more complex benthic habitats. The presence of marine and coastal habitats within the EMBA is summarised in Table 3-5.

There are no known offshore reefs or islands within or in close proximity (<20 km) to the OAs. However, there are a number of emergent oceanic reefs and islands within the EMBA, including Bedout Island, North Turtle Island, Clerke Reef, Mermaid Reef and Imperious Reef (see Section 3.2.4.2.1).

#### *3.2.4.2.1 Islands and reefs*

Benthic habitats such as reefs, shoals, banks and islands typically have a higher diversity and abundance of marine organisms than bare sediments. Islands and associated emergent reefs provide intertidal and shoreline habitats for a variety of marine fauna and ecological communities. The EMBA intersects several islands and emergent reefs:

- Airlie Island
- Barrow Island
- Bedout Island
- Bessieres Islands
- Boodie, Double Middle Islands
- Glomar Shoals
- Houtman Abrolhos Islands
- Little Rocky Island
- Locker Island
- Lowendal Islands
- Montebello Islands
- Muiron Islands
- North Sandy Island
- North Turtle Island
- Round Island
- Rowley Shoals
- Serrurier Island
- Victor Island
- Y Island.

The values and sensitivities of the closest islands and reefs are summarised below. Further details are provided in Appendix C.

Bedout Island, an A-class nature reserve, is located 65 km from the closest OA (Mestrel/Bancroft) and 135 km from the furthest OA (Ara). The island is a low and undulating, 0.3 km² sandy cay on limestone bedrock, heavily vegetated with *Spinifex longifolius*. Bedout Island supports breeding birds such as masked booby, white-bellied sea eagle, silver gull, crested tern and lesser crested tern (BirdLife International, 2018). Burbidge et al. (1987) report numbers of occupied nests of brown booby (~10,000 one of the largest colonies in Western Australia), masked booby (~178) and lesser frigate bird (2,290) surveyed in 1984 on Bedout Island. Bedout Island is fringed by coral reef and provides seabird and turtle feeding habitat.

North Turtle Island is an A-class nature reserve located 84 km south of the closest OA (Mestrel/Bancroft) and 170 km from the furthest OA (Ara). The island is fringed by coral reef and provides turtle and seabird nesting and foraging habitat (BHP, 2011).

Rowley Shoals, located 45 km from the nearest OA (Ara) and 156 km from the furthest OA (Mestrel/Bancroft), comprises three distinct reef systems, Imperieuse Reef, Clerke Reef and Mermaid Reef, each located ~30–40 km apart. The reefs rise vertically to the surface from depths of between 500 and 700 m. Mermaid Reef includes low lying sandy cays which are completely submerged at high tide and therefore fall under Australian Government jurisdiction (Commonwealth waters). The other two reefs, Clerke Reef and Imperieuse Reef are emergent reefs with sandy islets above the high-water mark and are managed as the WA Rowley Shoals Marine Park (MP).

Bedwell Island on Clerke Reef and Cunningham Island on Imperieuse Reef consist of unvegetated sand cays about 2 m and 3.7 m high respectively. Bedwell Island is home to one of only two colonies of red-tailed tropicbirds in WA (the other being located at Ashmore Reef and Cartier Island), along with several other bird species. Bedwell Island also provides occasional nesting habitat for a small number of hawksbill and green turtles. Both Bedwell Island and Cunningham Island are known resting sites for migratory birds (DoEC, 2007). The marine reef fauna of the Rowley Shoals is considered to be exceptionally rich and diverse, including species typical of the oceanic coral reef communities of the Indo-West Pacific. As many of these species are not found in the inshore tropical waters of northern Australia, such populations are of regional significance (DSEWPaC, 2012a).

The Glomar Shoals, a submerged littoral feature and listed KEF (DSEWPaC 2012a) is located 135 km from the nearest OA (Curie) and is discussed further in Section 3.2.5.3.

The shoals and banks in the EMBA contain benthic habitats and associated fauna assemblages that are highly diverse compared to the surrounding relatively deep and bare seabed that constitutes the majority of the outer continental shelf in the region. These shoals and banks may act as important sources of larvae of important taxa such as fish and corals, which may be advected considerable distances. The shoals and banks support many of the same species found on emergent reef systems of the Indo-West Pacific region. This indicates a high level of ecological connectivity among the reef systems and between the shoals and banks. This is further supported by an analysis undertaken by the Australian Institute of Marine Science that compared benthic habitat community data from a number of shoals and banks in the Timor Sea and Bonaparte Gulf region. The analysis showed that neighbouring shoals and banks frequently share many attributes in terms of benthic community composition and species (Wahab et al., 2018).

#### *3.2.4.2.2 Shoreline and coastal habitats*

The closest shorelines to the OAs are Port Hedland on the mainland, 123 km from the closest OA (Mestrel/Bancroft), and the Rowley Shoals (Bedwell Island on Clerke Reef and Cunningham Island on Imperieuse Reef), located 45 km from the nearest OA (Ara). The EMBA intersects with several other islands and emergent reefs (see Section 3.2.4.2.1). Coastal habitats including mangroves, intertidal platforms, sandy beaches, and rocky shorelines are associated with these shorelines, and provide habitats for a variety of marine fauna and ecological communities.

Mangroves deliver ecological value associated with sediment stabilisation, filtration, coastal protection and provision of breeding and nursery habitat (Kenyon et al. 2004; NOAA 2010). Arid-zone mangroves are found from Exmouth to Broome and are unique in comparison with tropical mangrove systems as they are smaller and less productive in correlation with rising sea levels and salinity stress (Environmental Protection Authority 2001).

Intertidal platforms, areas of hard bedrock and/or limestone inclusive of sediment veneers, provide diversity in habitat and biota.

Seagrasses, flowering plants that grow on the seabed in shallow marine environments, provide a range of valuable ecological functions, including primary production, habitat for biota, sediment stabilisation and have been found to provide important nursery habitat for fauna such as dugongs (DSEWPaC 2012a). Beyond the OAs, seagrasses are present within the EMBA where water depths allow for adequate light penetration (DSEWPaC 2012a). Seagrasses found to occur within the EMBA include small ephemeral species (e.g. *Halophila* spp., *Cymodocea* spp. and *Syringodium* spp.) and larger meadow-forming genera (e.g. *Posidonia* and *Amphibolis*) considered widespread along the Western Australian coast (McMahon et al. 2017; Kilminster et al. 2015).

Macroalgae are important contributors to primary production and nutrient cycling in the marine environment, providing food and habitat for fauna, such as green turtles and dugongs (Arthur et al. 2008). Macroalgae are present in coastal areas, reefs and intertidal platforms in the EMBA where water depth supports adequate light. Macroalgae are considered widespread along the Western Australian coast (DSEWPaC 2012a).

Further descriptions of these values and sensitivities are provided in Appendix C.

**Table 3-5: Benthic habitats within the EMBA**

| Category | Receptor | Presence in Combined Operational Area | Presence in EMBA | | | | | | | | | | Relevant Activities/Events That May Impact on The Receptors |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Central Western Province | Central Western Shelf Province | Central Western Shelf Transition | Central Western Transition | Northwest Province | Northwest Shelf Province | Northwest Shelf Transition | Northwest Transition | Southwest Shelf Transition | Timor Province | |
| Benthic Habitats | Coral reefs | ✗ | ✗ | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | **Unplanned**<br>Hydrocarbon release due to subsea or surface loss of well control.<br>Diesel release from vessel collision. |
| | Seagrass | ✗ | ✗ | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Macroalgae | ✗ | ✗ | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Non-coral benthic invertebrates | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | **Planned**<br>Seabed disturbance.<br>Planned operational discharges including drilling and cement discharges.<br><br>**Unplanned**<br>Hydrocarbon release due to subsea or surface loss of well control.<br>Diesel release from vessel collision.<br>Unplanned release of solids.<br>Introduction of invasive marine species.<br>Unplanned chemical releases. |
| Shoreline Habitats | Mangroves | ✗ | ✗ | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✗ | ✓ | **Unplanned**<br>Hydrocarbon release due to subsea or surface well release.<br>Diesel release from vessel collision. |
| | Intertidal platforms | ✗ | ✗ | ✓ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | |
| | Sandy beaches | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ | ✓ | ✓ | ✗ | ✓ | ✓ | |
| | Rocky shorelines | ✗ | ✗ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | |

### 3.2.5 Protected and Significant Areas

Protected and significant areas identified in the OAs and EMBA are listed in Table 3-6 and illustrated in Figure 3-4 to Figure 3-8. Protected and significant areas that are terrestrial and not linked to the shoreline, that were identified in the EPBC Protected Matters search of the EMBA have been excluded as they are not considered relevant with respect to the modelled hydrocarbon concentrations of floating oil, in-water hydrocarbons (entrained and dissolved oil) and shoreline accumulations.

#### 3.2.5.1 Australian Marine Parks

The OAs do not overlap any Australian Marine Parks (AMPs). The EMBA overlaps with nine AMPs, specified in and shown in Figure 3-4. The AMP closest to the Mestrel/Bancroft OA is Eighty Mile Beach AMP (48 km) and the AMP closest to the Ara, Curie, and Wallace OAs is the Argo-Rowley Terrace AMP (40 km, 90 km and 93 km, respectively). Details on the distance of each OA from the AMPs within and adjacent the EMBA are included in Table 3-6.

The EPBC Act recognises AMPs for protecting and maintaining biological diversity and contributing to a national representative network of marine protected areas. Management plans for AMPs have been developed and came into force on 1 July 2018. Under these plans, AMPs are allocated conservation objectives based on the Australian IUCN reserve management principles in Schedule 8 of the *EPBC Regulations 2000*. These principles determine what activities are acceptable within a protected area under the EPBC Act. The marine park management zones that are relevant to the AMPs within the EMBA are listed in Table 3-7.

Oil and gas operations and associated oil spill response may be conducted in a Multiple Use Zone (IUCN VI) subject to the class approval and prescriptions in the *North-West Marine Parks Network Management Plan* (North-West MPNMP) (Director of National Parks, 2018). The Class Approval – Mining Operations and Greenhouse Gas Activities for the North-west MPNMP, which is applicable to petroleum-related activities, came into effect on 1 July 2018. Prescriptions/conditions of the North-west MPNMP and Class Approval for the North-west MPNMP that are considered relevant to the scope of this EP are provided in Table 3-8.

Section 3.2.7.1 includes details regarding cultural heritage and marine parks. The PMST reports (Appendix D) outline the AMPs intersected by the EMBA. Additional details on AMPs are provided in Appendix C.

#### 3.2.5.2 State Marine Parks, Management Areas and Reserves

The OAs do not intersect with any State protected areas (Figure 3-5). However, the EMBA intersects 13 marine State protected areas. These protected areas are detailed and the distance from each OA provided in Table 3-6. The closest State protected area to the Ara, Curie, and Wallace OAs is the Rowley Shoals Marine Park (45 km, 120 km, and 101 km, respectively) and the closest State protected area to the Mestrel/Bancroft OAs is the Eighty Mile Beach Marine Park (126 km).

The PMST reports (Appendix D) outline the State protected areas intersected by the EMBA. Further details on State protected areas, including Marine Parks, Management Areas and Reserves, are provided in Appendix C.

Section 3.2.7.1 includes details regarding cultural heritage and marine parks.

#### 3.2.5.3 Key Ecological Features

Key ecological features (KEFs) are components of the marine ecosystem that are considered important for biodiversity or ecosystem function and integrity of the Commonwealth Marine Area.

Ten KEFs were identified within the EMBA (Figure 3-6). No OAs overlap with any KEFs. The Ancient coastline at 125 m depth contour KEF is the closest KEF to OAs (7 km south of Curie OA). This relic shoreline, formed from changes in sea level over the last 100,000 years, is thought to be associated with unique complex bathymetrical features including rocky escarpments. Table 3-6 outlines the KEFs within and adjacent to the EMBA and specifies the distance to each from the OA.

The EPBC Act PMST results (Appendix D) outline any intersection with KEFs and further details are provided in Appendix C.

Section 3.2.7.1 includes details regarding cultural heritage.

#### 3.2.5.4 Heritage Areas

Australia's heritage is managed by various levels of government and peak bodies that identify and list places for their heritage values. Significant heritage places are identified and grouped by type into lists that guide the protection and management of heritage values. The three types of heritage places considered are World Heritage Areas (WHA), National Heritage Listed (NHL) areas and Commonwealth Heritage Listed (CHL) areas.

The OAs do not intersect any WHAs, CHL areas or NHL areas. However, the EMBA intersects with three WHAs, three NHL areas, and four CHL areas (Table 3-6, Figure 3-7). The closest WHA to the OAs is the UNESCO-listed Murujuga Cultural Landscape (200 km from the Mestrel/Bancroft and 202 km from the Curie OAs, respectively) and the closest CHL area to the OAs is Mermaid Reef–Rowley Shoals listed place (123 km from Ara OA). The Dampier Archipelago (including Burrup Peninsula) is the closest NHL area to the Curie, Mestrel/Bancroft and Wallace OAs (202 km, 200 km and 245 km respectively). The West Kimberley listed place is the closest NHL area to the Ara OA (282 km).

The EPBC Act PMST results (Appendix D) outline any intersection with heritage areas. Further details are provided in Appendix C.

#### 3.2.5.5 Wetlands of International or National Importance

Wetlands are a critical part of our natural environment. They protect our shores from wave action, reduce the impacts of flooding, absorb pollutants, and improve water quality. They provide habitat for animals and plants, and many contain a wide diversity of life, supporting plants and animals that are found nowhere else.

Five wetlands of national importance were identified within the EMBA (Table 3-6; Figure 3-8). No wetlands of international importance were identified within the EMBA. The closest wetlands of national importance to the OAs are:

- Eighty Mile Beach, Leslie (Port Hedland) – located 133 km from the Mestrel/Bancroft OA
- Saltfields System – located 113 km from the Mestrel/Bancroft OA
- Mermaid Reef – located 127 km from the Ara OA.

The EPBC Act PMST results (Appendix D) outline the wetlands of international and national importance that overlap the EMBA. Further details on these wetlands of international and national importance are provided in Appendix C.

**Table 3-6: Distance from Operational Area boundaries to protected areas and key ecological features within the EMBA**

| Name | Status, Zone or IUCN Classification | EMBA Presence | Distance to OAs | | | |
|---|---|---|---|---|---|---|
| | | | Ara | Curie | Mestrel/Bancroft | Wallace |
| **Australian Marine Parks** | | | | | | |
| **North-West Marine Region** | | | | | | |
| Argo-Rowley Terrace AMP | Multiple Use Zone (IUCN VI) | ✓ | 40 | 90 | 149 | 93 |
| | Special Purpose Zone (Trawl) (IUCN VI) | ✓ | 57 | 124 | 166 | 109 |
| | National Park Zone (IUCN II) | ✓ | 326 | 376 | 433 | 375 |
| Dampier AMP | Multiple Use Zone (IUCN VI) | ✓ | 262 | 166 | 144 | 200 |
| | Habitat Protection Zone (IUCN IV) | ✓ | 292 | 184 | 180 | 226 |
| | National Park Zone (IUCN II) | ✓ | 287 | 181 | 173 | 221 |
| Eighty Mile Beach AMP | Multiple Use Zone (IUCN VI) | ✓ | 127 | 103 | 48 | 99 |
| Gascoyne AMP | Multiple Use Zone (IUCN VI) | ✓ | 597 | 479 | 507 | 529 |
| | Habitat Protection Zone (IUCN IV) | ✓ | 737 | 619 | 632 | 668 |
| | National Park Zone (IUCN II) | ✓ | 807 | 689 | 716 | 739 |
| Kimberley AMP | Multiple Use Zone (IUCN VI) | ✓ | 244 | 342 | 344 | 311 |
| Mermaid Reef AMP | National Park Zone (IUCN II) | ✓ | 114 | 204 | 230 | 181 |
| Montebello AMP | Multiple Use Zone (IUCN VI) | ✓ | 359 | 240 | 263 | 290 |
| Ningaloo AMP | Recreational Use Zone (IUCN IV) | ✓ | 611 | 494 | 507 | 542 |
| | National Park Zone (IUCN II) | ✓ | 733 | 617 | 624 | 664 |
| Shark Bay AMP | Multiple Use Zone (IUCN VI) | ✓ | 892 | 781 | 778 | 825 |
| **State Marine Parks, Management Areas and Reserves** | | | | | | |
| Barrow Island Marine Management Area | Unzoned (with exception of Bandicoot Bay Conservation Area) | ✓ | 424 | 306 | 323 | 355 |
| Barrow Island MP | Multiple Use Zone (IUCN VI), Nature Reserve (IUCN Ia) | ✓ | 454 | 336 | 353 | 385 |
| Eighty Mile Beach MP | General Use Zone, Special Purpose Zone, Sanctuary Zone | ✓ | 185 | 181 | 126 | 172 |
| Great Sandy Island Nature Reserve | Nature Reserve (IUCN Ia) | ✓ | 382 | 270 | 271 | 314 |

| Name | Status, Zone or IUCN Classification | EMBA Presence | Distance to OAs | | | |
|---|---|---|---|---|---|---|
| | | | Ara | Curie | Mestrel/Bancroft | Wallace |
| Montebello Islands Conservation Park | Conservation Area (IUCN II) | ✓ | 414 | 296 | 316 | 345 |
| Montebello Islands MP | General Use Zone | ✓ | 408 | 290 | 309 | 339 |
| Muiron Islands Marine Management Area | Multiple Use Zone (IUCN VI) | ✓ | 590 | 473 | 485 | 521 |
| Ningaloo MP | Recreation Zone, Sanctuary Zone, Special Purpose Zone, General Use Zone. | ✓ | 611 | 494 | 505 | 542 |
| Rocky Island Nature Reserve | Nature Reserve (IUCN Ia) | ✓ | 594 | 479 | 486 | 526 |
| Rowley Shoals MP | General Use Zone, Recreation Zone, Sanctuary Zone | ✓ | 45 | 120 | 156 | 101 |
| Scott Reef Nature Reserve | Nature Reserve (IUCN Ia) | ✓ | 526 | 614 | 638 | 591 |
| Thevenard Island Nature Reserve | Nature Reserve (IUCN Ia) | ✓ | 530 | 414 | 423 | 461 |
| Bedout Island Nature Reserve | Nature Reserve (IUCN Ia) | ✓ | 131 | 118 | 65 | 110 |
| **World Heritage Areas** | | | | | | |
| Shark Bay, Western Australia | Declared Property | ✓ | 906 | 800 | 789 | 842 |
| The Ningaloo Coast | Declared Property | ✓ | 590 | 473 | 485 | 521 |
| Murujuga Cultural Landscape | Declared Property | ✓ | 312 | 202 | 200 | 245 |
| **National Heritage Listed Places** | | | | | | |
| Dampier Archipelago (including Burrup Peninsula) | Listed Place – Indigenous | ✓ | 312 | 202 | 200 | 245 |
| Shark Bay, Western Australia | Listed Place – Natural | ✓ | 908 | 800 | 789 | 842 |
| The Ningaloo Coast | Listed Place – Natural | ✓ | 590 | 473 | 485 | 521 |
| **Commonwealth Heritage Listed Places** | | | | | | |
| Learmonth Air Weapons Range Facility | Listed Place – Natural | ✓ | 688 | 573 | 580 | 620 |
| Mermaid Reef–Rowley Shoals | Listed Place – Natural | ✓ | 123 | 215 | 239 | 190 |
| Ningaloo Marine Area – Commonwealth Waters | Listed Place – Natural | ✓ | 611 | 494 | 507 | 542 |
| Scott Reef and Surrounds – Commonwealth Area | Listed Place – Natural | ✓ | 530 | 621 | 645 | 598 |
| **Wetlands of National Importance** | | | | | | |
| Cape Range Subterranean Waterways | - | ✓ | 623 | 506 | 519 | 555 |

| Name | Status, Zone or IUCN Classification | EMBA Presence | Distance to OAs | | | |
|---|---|---|---|---|---|---|
| | | | Ara | Curie | Mestrel/Bancroft | Wallace |
| Eighty Mile Beach System | - | ✓ | 191 | 189 | 133 | 181 |
| Exmouth Gulf East | - | ✓ | 576 | 462 | 467 | 508 |
| Leslie (Port Hedland) Saltfields System | - | ✓ | 200 | 164 | 113 | 170 |
| Mermaid Reef | - | ✓ | 127 | 217 | 243 | 194 |
| **Key Ecological Features** | | | | | | |
| **North-West Marine Region** | | | | | | |
| Ancient coastline at 125 m depth contour | - | ✓ | 7 | 7 | 19 | 11 |
| Canyons linking the Argo Abyssal Plain with the Scott Plateau | - | ✓ | 410 | 472 | 520 | 463 |
| Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula | - | ✓ | 565 | 447 | 461 | 495 |
| Commonwealth waters adjacent to Ningaloo Reef | - | ✓ | 611 | 494 | 507 | 542 |
| Continental Slope Demersal Fish Communities | - | ✓ | 243 | 267 | 301 | 307 |
| Exmouth Plateau | - | ✓ | 476 | 374 | 410 | 421 |
| Glomar Shoals | - | ✓ | 253 | 135 | 159 | 184 |
| Mermaid Reef and Commonwealth waters surrounding Rowley Shoals | - | ✓ | 36 | 111 | 148 | 93 |
| Seringapatam Reef and Commonwealth waters in the Scott Reef Complex | - | ✓ | 520 | 609 | 633 | 586 |
| **South-West Marine region** | | | | | | |
| Western demersal slope and associated fish communities | - | ✓ | 1051 | 939 | 934 | 983 |

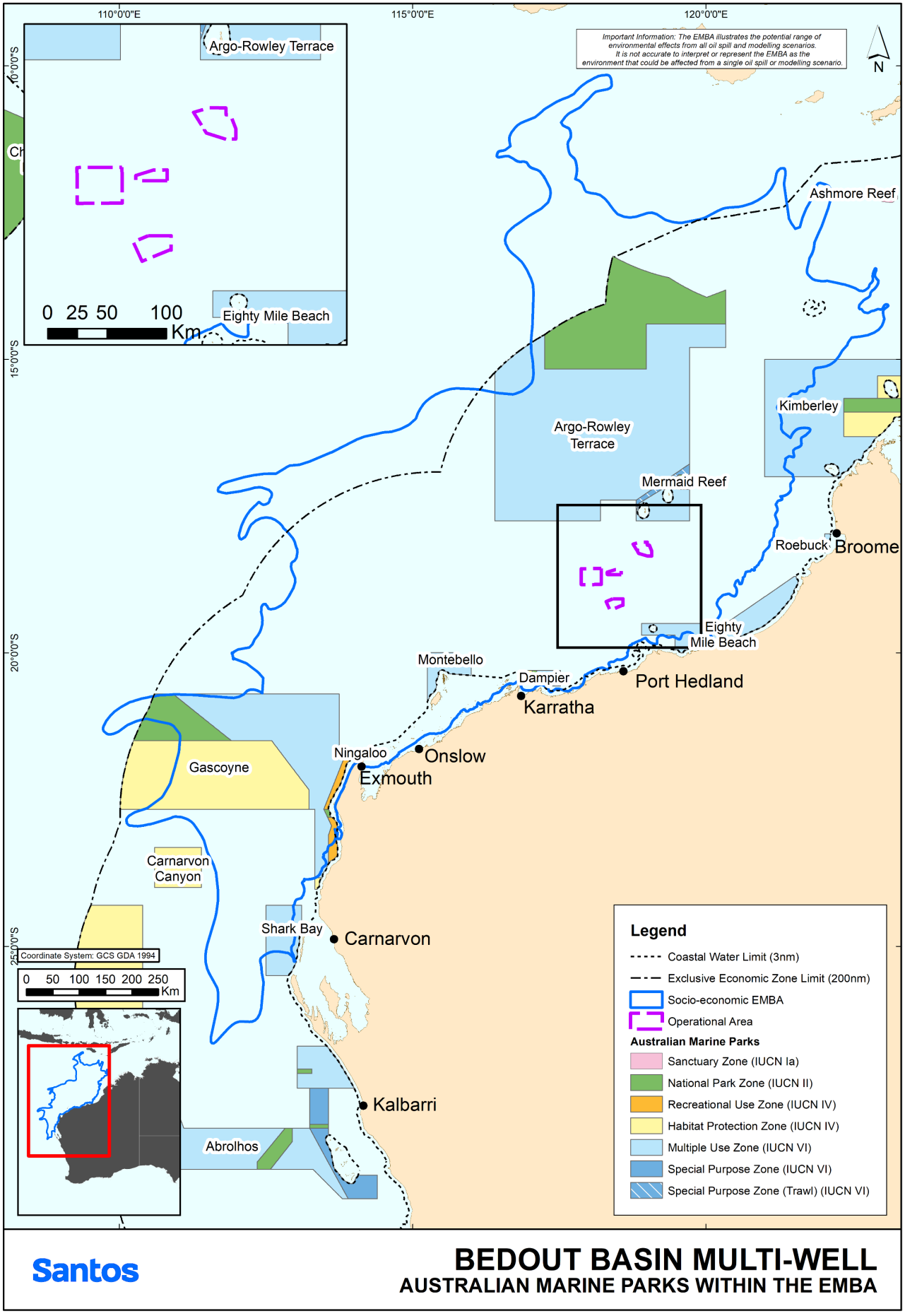



**Figure 3-4: Australian Marine Parks in the vicinity of the OAs and environment that may be affected**

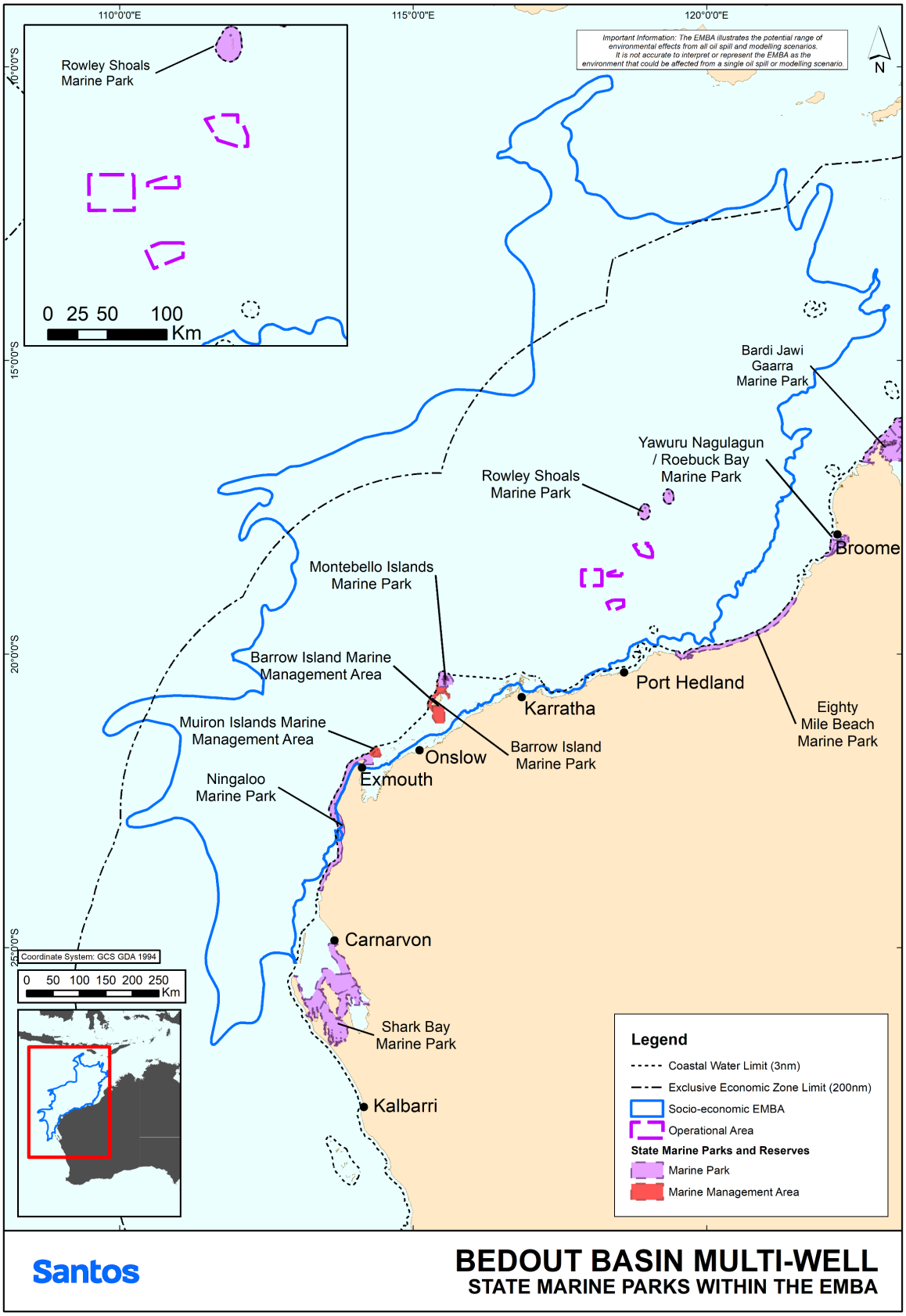



**Figure 3-5: State Marine Parks and Marine Management Areas in the vicinity of the OAs and environment that may be affected**

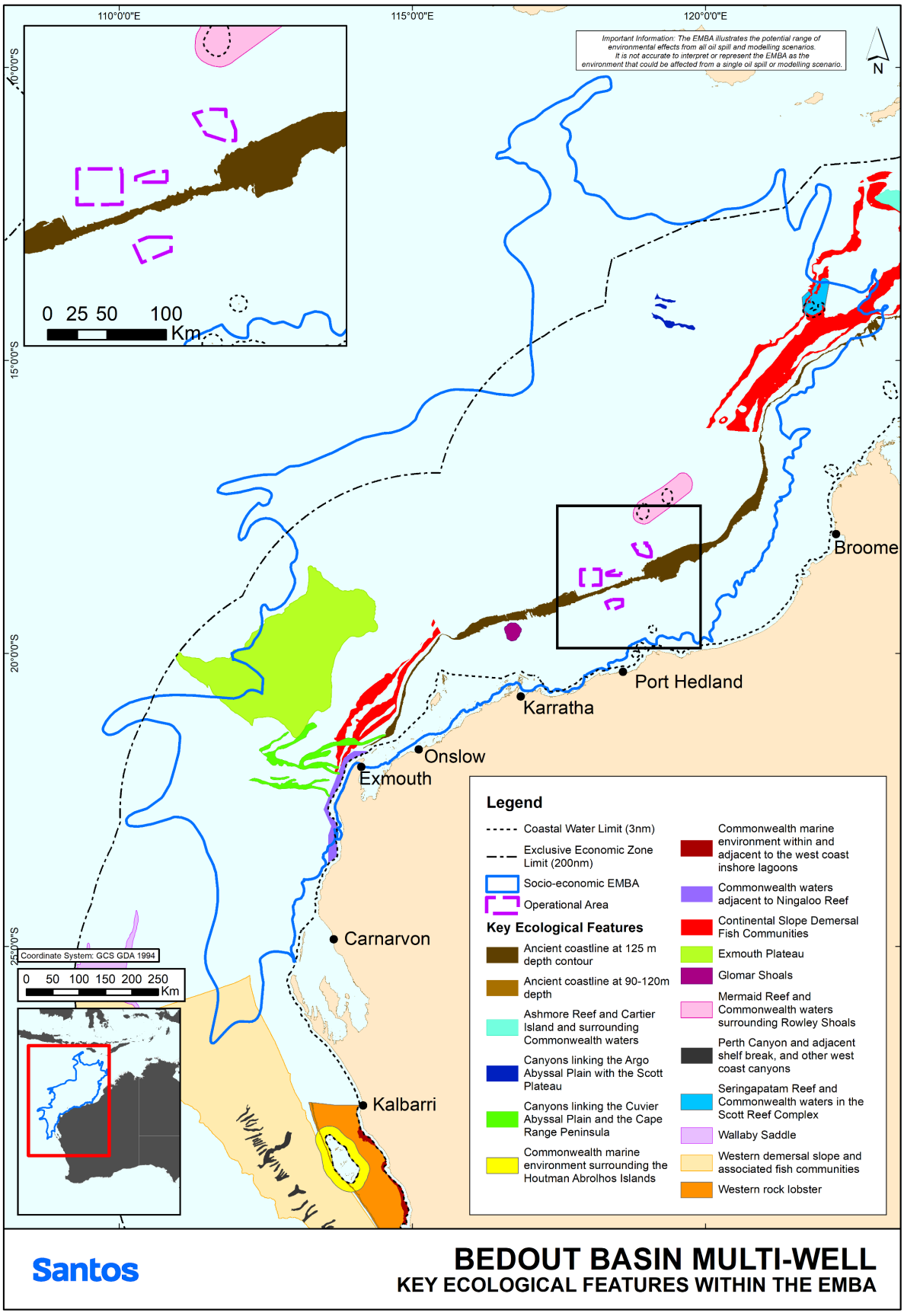



**Figure 3-6: Key ecological features in the vicinity of the OAs and environment that may be affected**

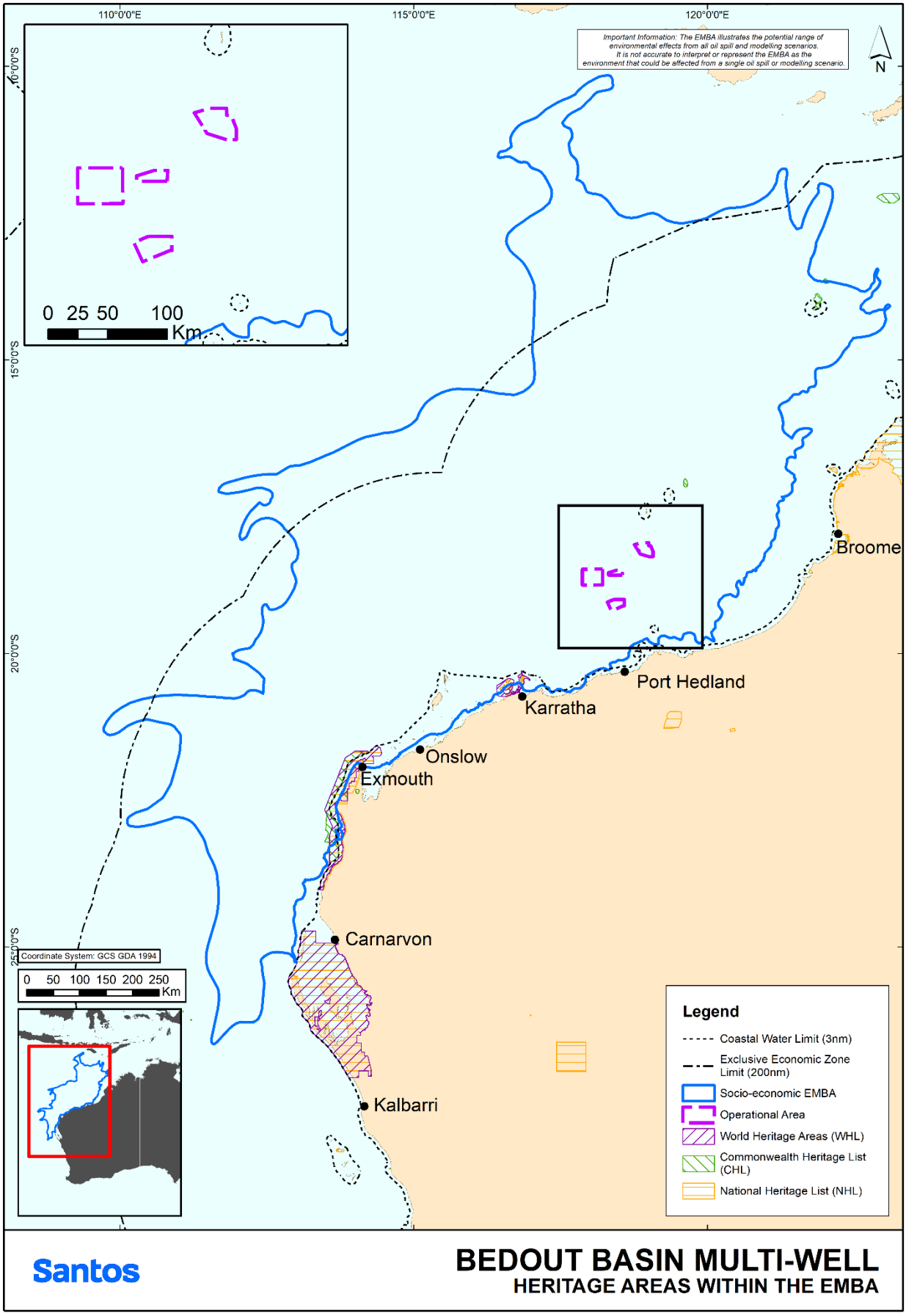



**Figure 3-7: Heritage areas in the vicinity of the OAs and environment that may be affected**

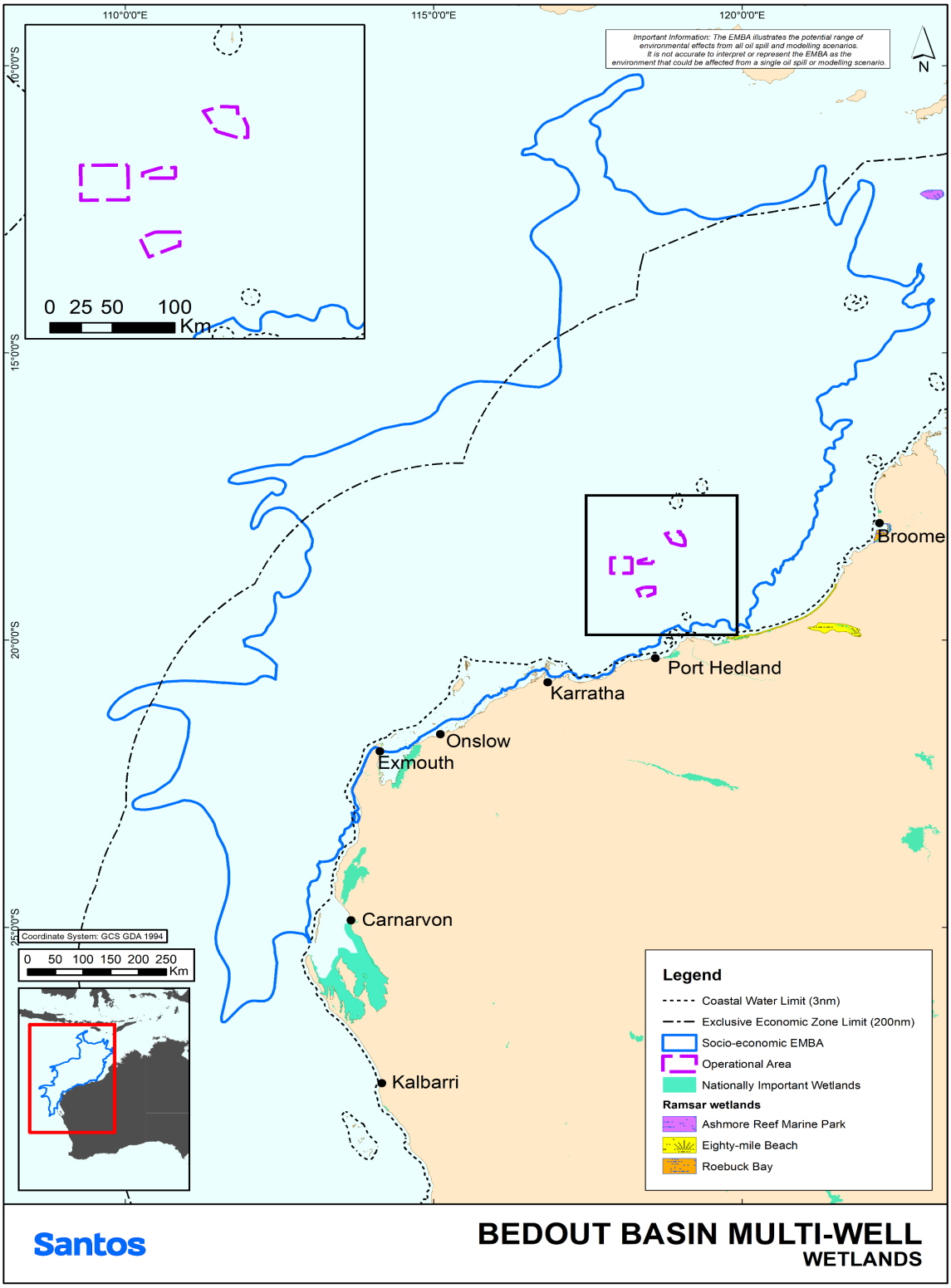



**Figure 3-8: Wetlands of international significance (RAMSAR) in the vicinity of the OAs and environment that may be affected**

**Table 3-7: Australian and State marine management zones**

| Management Zones | Objective |
|---|---|
| **Australian Marine Parks**[4] | |
| Nature Reserve (IUCN Ia) | The objective is to protect ecosystems, geological/physiological features and native species for scientific research and environmental monitoring. |
| National Park Zone (IUCN II) | The objective is to preserve natural biodiversity with its underlying ecological structure and supporting environmental processes, and to promote education and recreation. |
| Recreational Use (IUCN IV) | The objective is to provide for the conservation of ecosystems, habitats, and native species in as natural a state as possible, while providing for recreational use. |
| Habitat Protection Zone (IUCN IV) | The objective is to provide for the conservation of ecosystems, habitats, and native species in as natural a state as possible, while allowing activities that do not harm or cause destruction to seafloor habitats. |
| Protected Seascape (IUCN V) | The objective is to provide for the protection of ecosystems, habitats, native species and cultural values associated with the area, while allowing for sustainable use of the area. |
| Multiple Use (IUCN VI) | The objective is to provide for ecologically sustainable use and the conservation of ecosystems, habitats, and native species. |
| Special Purpose Zone | The objective is to protect natural ecosystems and use natural resources sustainably, when conservation and sustainable use can be mutually beneficial. |
| **State Marine Parks**[5] | |
| Sanctuary Zones | The primary purpose of sanctuary zones is for the protection and conservation of marine biodiversity. Sanctuary zones are 'no-take' areas managed solely for nature conservation and low-impact recreation and tourism. |
| Special Purpose Zones | *Special purpose (benthic protection) zone*: This zone has the priority purpose of conservation of benthic habitat.<br>*Special purpose (shore-based activities) zone:* Special purpose zones in marine parks are managed for a priority purpose or use, such as a seasonal event (e.g. wildlife breeding, whale watching) or a commercial activity (e.g. pearling). |
| Recreation Zones | Recreation zones have the primary purpose of providing opportunities for recreational activities, including fishing, for visitors and for commercial tourism operators, where these activities are compatible with the maintenance of the values of the zone. |
| General Use Zones | Conservation of natural values is still the priority of general use zones, but activities such as sustainable commercial and recreational fishing, aquaculture, pearling and petroleum exploration and production may be permitted provided they do not compromise the ecological values of the marine park. |

**Table 3-8: Prescriptions/conditions from the North-West and South-West Marine Parks Network Management Plan 2018 relevant to the activities in this EP**

| Prescription/ Condition Number | Prescription/Condition | Relevant Section of EP |
|---|---|---|
| **North-West MPNMP (Director of National Parks (DNP), 2018)** | | |
| 4.2.9.8 | Notwithstanding Section 4.2.9.1 (of the North-West MPNMP), actions required to respond to oil pollution incidents, including environmental monitoring and remediation, in connection with mining operations authorised under the OPGGS Act, may be conducted in all zones without an authorisation issued by the Director, provided that the actions are taken in accordance with:<br>• an environment plan that has been accepted by NOPSEMA<br>• the Director is notified in the event of oil pollution within a marine park, or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, prior to response action being taken. | This EP: Section 4, Stakeholder Consultation.<br><br>OPEP: reporting under Section 7 |

[4] *As defined by Commonwealth of Australia (2002).*

[5] *As defined by Government of Western Australia (2024).*

| Prescription/ Condition Number | Prescription/Condition | Relevant Section of EP |
|---|---|---|
| **South-West MPNMP (DNP, 2018)** | | |
| 4.2.8.8 | Notwithstanding Section 4.2.8.1 (of the South-West MPNMP), actions required to respond to oil pollution incidents, including environmental monitoring and remediation, in connection with mining operations authorised under the OPGGS Act, may be conducted in all zones without an authorisation issued by the Director, provided that the actions are taken in accordance with:<br>• an environment plan that has been accepted by NOPSEMA<br>• notifying the Director in the event of oil pollution within a marine park, or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, prior to response action being taken. | This EP: Section 4, Stakeholder Consultation<br><br>OPEP: reporting under Section 7 |
| **Class Approval – Mining Operations and Green House Gas Activities – for North-West and South-West MPNMP (DNP, 2018)** | | |
| 1 | Approved action must be conducted in accordance with:<br>• an Environment Plan accepted under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations (2023) | The OPEP (some proposed response activities in the event of an oil pollution incident may be undertaken within the North-West Marine Park Network) |
| | • the EPBC Act | Appendix B (Legislation) |
| | • the EPBC Regulations | This EP |
| | • the North-west Network Management Plan | This table |
| | • any prohibitions, restrictions or determinations made under the EPBC Regulations by the Director of National Parks | Not applicable |
| | • all other applicable Commonwealth and state and territory laws (to the extent those laws are capable of operating concurrently with the laws and instruments described in paragraphs a to e)). | Appendix B (Legislation), and the OPEP |
| 2 | If requested by the Director of National Parks, an Approved Person must notify the Director prior to conducting Approved Actions within Approved Zones.<br>Note: the timeframe for prior notice will be agreed to by the Director of National Parks and the Approved Person. | OPEP: Section 8.9 (Reporting) and Section 7 |
| 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.<br>Note: the information required, and timeframe within which it is required, will be agreed to by the Director of National Parks and the Approved Person. | Not applicable |

### 3.2.6 Threatened and Migratory Fauna

The PMST reports for the OAs and EMBA (Appendix D) were utilised to identify species classified as Threatened (Conservation dependant, Vulnerable, Endangered, Critically Endangered) or Migratory under the EPBC Act. Those listed as Threatened or Migratory under the EPBC Act that have been identified as potentially being present in the OAs and EMBA are discussed in Table 3-9.

Terrestrial species considered MNES appearing in the PMST reports that are not considered to interact with the marine environment, based on the species profiles published on the DCCEEW Species Profile and Threats database, were not considered relevant to the activity impacts and therefore have been excluded from Table 3-9 and are not discussed further. Marine species that were not classed as Threatened or Migratory were not considered MNES under the EPBC Act and were also excluded from Table 3-9 and are not discussed further. Each species identified as Threatened or Migratory under the EPBC Act were also assessed for their status under the Western Australia *Biodiversity Conservation Act 2016* (BC Act) and their extent of likely presence, including any overlap with designated biologically important areas (BIAs) (Table 3-9). Planned activities and unplanned events

associated with the activities outlined in Section 2 that may have an impact on the relevant MNES are also included in Table 3-9.

The PMST report for OAs identified a total of 23 marine fauna species listed as Threatened, and an additional 23 marine fauna species listed as Migratory under the EPBC Act. Of these 46 species, 13 were fish or sharks, 11 were marine mammals, seven were marine reptiles and 15 were marine birds. The total number of species listed above include the total number of species that may be present in all of the OAs. Refer to Table 3-9 for a breakdown of Threatened and Migratory species, and species types that may be present in the individual Ara, Curie, Mestrel/Bancroft and Wallace OAs.

There were 47 listed Threatened species, and an additional 42 migratory species were identified as potentially occurring in marine or shoreline habitats within the EMBA. Of these 89 species, 16 were fish or sharks, 13 were marine mammals, Ten were marine reptiles and 50 were marine birds.

Further details of these species are provided in Appendix C.

**Table 3-9: Environmental values and sensitivities within the environment that may be affected and OA – threatened and migratory marine fauna**

| Value/sensitivity | | Conservation Status | | Presence in OAs | | | | Presence in EMBA | Relevant Activities/Events |
|---|---|---|---|---|---|---|---|---|---|
| Common name | Scientific name | EPBC Act | BC Act | Ara | Curie | Mestrel/Bancroft | Wallace | | |
| **Protected Species and Communities: Fish and Sharks** | | | | | | | | | |
| Scalloped Hammerhead | *Sphyrna lewini* | CD | - | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | X | X | Species or species habitat known to occur within area | **Planned**<br>Light emissions<br>Noise emissions<br>Planned operational discharges<br>Drilling discharges<br>Spill response operations<br><br>**Unplanned**<br>Introduction of invasive marine species<br>Marine fauna interaction<br>Hydrocarbon spills/releases<br>Non-hydrocarbon and chemical releases<br>Minor hydrocarbon releases |
| Little Gulper Shark | *Centrophorus uyato* | CD | - | X | X | X | X | Species or species habitat likely to occur within area | |
| Northern River Shark, New Guinea River Shark | *Glyphis garricki* | EN | P1 | X | X | X | X | Species or species habitat may occur within area | |
| White Shark, Great White Shark | *Carcharodon carcharias* | VU MI | VU | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Foraging, feeding or related behaviour known to occur within area | |
| Whale Shark | *Rhincodon typus* | VU MI | MI | Foraging, feeding or related behaviour known to occur within area | Foraging, feeding or related behaviour known to occur within area | Foraging, feeding or related behaviour known to occur within area | Foraging, feeding or related behaviour known to occur within area | Foraging, feeding or related behaviour known to occur within area | |
| Green Sawfish, Dindagubba, Narrowsnout Sawfish | *Pristis zijsron* | VU MI | VU | Species or species habitat known to occur within area | Species or species habitat known to occur within area | Species or species habitat known to occur within area | Species or species habitat known to occur within area | Breeding known to occur within area | |
| Dwarf Sawfish, Queensland Sawfish | *Pristis clavata* | VU MI | P1 MI | X | X | Species or species habitat known to occur within area | X | Breeding known to occur within area | |
| Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish | *Pristis pristis* | VU MI | P3 MI | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat known to occur within area | |
| Grey Nurse Shark (west coast population) | *Carcharias taurus* (west coast population) | VU | - | Congregation or aggregation known to occur within area | Congregation or aggregation known to occur within area | Congregation or aggregation known to occur within area | Congregation or aggregation known to occur within area | Congregation or aggregation known to occur within area | |
| Narrow Sawfish, Knifetooth Sawfish | *Anoxypristis cuspidata* | MI | MI | Species or species habitat may occur within area | Species or species habitat known to occur within area | Species or species habitat likely to occur within area | Species or species habitat known to occur within area | Species or species habitat known to occur within area | |
| Porbeagle, Mackerel Shark | *Lamna nasus* | MI | MI | X | X | X | X | Species or species habitat may occur within area | |
| Longfin Mako | *Isurus paucus* | MI | MI | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | |
| Shortfin Mako, Mako Shark | *Isurus oxyrinchus* | MI | MI | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | |
| Oceanic Whitetip Shark | *Carcharhinus longimanus* | MI | - | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat likely to occur within area | |
| Reef Manta Ray, Coastal Manta Ray | *Mobula alfredi* | MI | MI | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat known to occur within area | |

| Value/sensitivity | | Conservation Status | | Presence in OAs | | | | Presence in EMBA | Relevant Activities/Events |
|---|---|---|---|---|---|---|---|---|---|
| Common name | Scientific name | EPBC Act | BC Act | Ara | Curie | Mestrel/Bancroft | Wallace | | |
| Giant Manta Ray | *Mobula birostris* | MI | MI | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat known to occur within area | |
| **Protected Species and Communities: Marine Mammals** | | | | | | | | | |
| Southern Right Whale | *Eubalaena australis* | EN MI | VU | ✗ | ✗ | ✗ | ✗ | Species or species habitat likely to occur within area | **Planned**<br>Noise emissions<br>Planned operational discharges<br>Drilling discharges<br>Spill response operations<br><br>**Unplanned**<br>Marine fauna interaction<br>Hydrocarbon spills/releases<br>Non-hydrocarbon and chemical releases<br>Release of solid objects |
| Blue Whale | *Balaenoptera musculus* | EN MI | EN | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Migration route known to occur within area | |
| Sei Whale | *Balaenoptera borealis* | VU MI | EN | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Foraging, feeding or related behaviour likely to occur within area | |
| Fin Whale | *Balaenoptera physalus* | VU MI | EN | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Foraging, feeding or related behaviour likely to occur within area | |
| Humpback Whale | *Megaptera novaeangliae* | MI | CD MI | Species or species habitat known to occur within area | Species or species habitat known to occur within area | Breeding known to occur within area | Species or species habitat known to occur within area | Breeding known to occur within area | |
| Killer Whale, Orca | *Orcinus orca* | MI | MI | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | |
| Australian Humpback Dolphin | *Sousa sahulensis* | MI | P4 MI | ✗ | ✗ | Species or species habitat may occur within area | ✗ | Species or species habitat known to occur within area | |
| Sperm Whale | *Physeter macrocephalus* | MI | VU | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | |
| Dugong | *Dugong dugon* | MI | MI | ✗ | ✗ | Species or species habitat may occur within area | ✗ | Breeding known to occur within area | |
| Australian Snubfin Dolphin | *Orcaella heinsohni* | MI | P4 MI | ✗ | ✗ | Species or species habitat may occur within area | ✗ | Species or species habitat known to occur within area | |
| Bryde's Whale | *Balaenoptera edeni* | MI | MI | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat may occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | |
| Antarctic Minke Whale, Dark-shoulder Minke Whale | *Balaenoptera bonaerensis* | MI | MI | ✗ | ✗ | ✗ | ✗ | Species or species habitat likely to occur within area | |
| Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) | *Tursiops aduncus* (Arafura/Timor Sea populations) | MI | - | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat likely to occur within area | Species or species habitat may occur within area | Species or species habitat known to occur within area | |
| **Protected Species and Communities: Marine Reptiles** | | | | | | | | | |
| Short-nosed Sea Snake, Short-nosed Seasnake | *Aipysurus apraefrontalis* | CR | CR | ✗ | ✗ | Species or species habitat may occur within area | ✗ | Species or species habitat known to occur within area | **Planned**<br>Light emissions<br>Noise emissions<br>Planned operational discharges<br>Drilling discharges<br>Spill response operations<br><br>**Unplanned**<br>Marine fauna interaction<br>Hydrocarbon spills/releases |
| Leaf-scaled Sea Snake, Leaf-scaled Seasnake | *Aipysurus foliosquama* | CR | CR | ✗ | ✗ | ✗ | ✗ | Species or species habitat known to occur within area | |
| Dusky Sea Snake | *Aipysurus fuscus* | EN | - | ✗ | ✗ | ✗ | ✗ | Species or species habitat known to occur within area | |
| Olive Ridley Turtle, Pacific Ridley Turtle | *Lepidochelys olivacea* | EN MI | EN | ✗ | ✗ | ✗ | ✗ | Foraging, feeding or related behaviour likely to occur within area | |

| Value/sensitivity | | Conservation Status | | Presence in OAs | | | | Presence in EMBA | Relevant Activities/Events |
|---|---|---|---|---|---|---|---|---|---|
| Common name | Scientific name | EPBC Act | BC Act | Ara | Curie | Mestrel/Bancroft | Wallace | | |
| Leatherback Turtle, Leathery Turtle, Luth | *Dermochelys coriacea* | EN MI | VU | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Foraging, feeding or related behaviour known to occur within area | Non-hydrocarbon and chemical releases<br>Release of solid objects |
| Loggerhead Turtle | *Caretta caretta* | EN MI | EN | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat known to occur within area | Species or species habitat likely to occur within area | Breeding known to occur within area | |
| Flatback Turtle | *Natator depressus* | VU MI | VU | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Congregation or aggregation known to occur within area | Species or species habitat likely to occur within area | Breeding known to occur within area | |
| Hawksbill Turtle | *Eretmochelys imbricata* | VU MI | VU | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat known to occur within area | Species or species habitat likely to occur within area | Breeding known to occur within area | |
| Green Turtle | *Chelonia mydas* | VU MI | VU | Species or species habitat known to occur within area | Species or species habitat likely to occur within area | Species or species habitat known to occur within area | Species or species habitat likely to occur within area | Breeding known to occur within area | |
| Salt-water Crocodile, Estuarine Crocodile | *Crocodylus porosus* | MI | MI | ✗ | ✗ | Species or species habitat may occur within area | ✗ | Species or species habitat likely to occur within area | |
| **Protected Species and Communities: Marine Birds** | | | | | | | | | |
| Curlew Sandpiper | *Calidris ferruginea* | CR MI | CR | ✗ | ✗ | Species or species habitat may occur within area | ✗ | Species or species habitat known to occur within area | **Planned**<br>Light emissions<br>Noise emissions<br>Atmospheric emissions<br>Planned operational discharges<br>Drilling discharges<br>Spill response operations<br><br>**Unplanned**<br>Marine fauna interaction<br>Hydrocarbon spills/releases<br>Non-hydrocarbon and chemical releases<br>Release of solid objects |
| Eastern Curlew, Far Eastern Curlew | *Numenius madagascariensis* | CR MI | CR | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat known to occur within area | |
| Amsterdam Albatross | *Diomedea amsterdamensis* | EN MI | CR | ✗ | ✗ | ✗ | ✗ | Species or species habitat likely to occur within area | |
| Shy Albatross | *Thalassarche cauta* | EN MI | VU | ✗ | ✗ | ✗ | ✗ | Species or species habitat may occur within area | |
| Abbott's Booby | *Papasula abbotti* | EN | - | Species or species habitat may occur within area | Species or species habitat may occur within area | ✗ | Species or species habitat may occur within area | Species or species habitat may occur within area | |
| Christmas Island White-tailed Tropicbird, Golden Bosunbird | *Phaethon lepturus fulvus* | EN | - | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | |
| Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit | *Limosa lapponica menzbieri* | EN | CR | ✗ | ✗ | ✗ | ✗ | Species or species habitat known to occur within area | |
| Southern Giant-Petrel, Southern Giant Petrel | *Macronectes giganteus* | EN MI | MI | ✗ | ✗ | ✗ | ✗ | Species or species habitat may occur within area | |
| Common Greenshank, Greenshank | *Tringa nebularia* | EN MI | MI | ✗ | ✗ | ✗ | ✗ | Species or species habitat known to occur within area | |
| Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird | *Phaethon rubricauda westralis* | EN | - | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Breeding known to occur within area | |
| Australian Painted Snipe | *Rostratula australis* | EN | EN | ✗ | ✗ | ✗ | ✗ | Species or species habitat likely to occur within area | |
| Soft-plumaged Petrel | *Pterodroma mollis* | VU | - | ✗ | ✗ | ✗ | ✗ | Foraging, feeding or related behaviour likely to occur within area | |

| Value/sensitivity | | Conservation Status | | Presence in OAs | | | | Presence in EMBA | Relevant Activities/Events |
|---|---|---|---|---|---|---|---|---|---|
| Common name | Scientific name | EPBC Act | BC Act | Ara | Curie | Mestrel/Bancroft | Wallace | | |
| Greater Sand Plover, Large Sand Plover | *Charadrius leschenaultii* | VU MI | VU | ✗ | ✗ | ✗ | ✗ | Species or species habitat known to occur within area | |
| Sharp-tailed Sandpiper | *Calidris acuminata* | VU MI | MI | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Roosting known to occur within area | |
| Wandering Albatross | *Diomedea exulans* | VU MI | VU | ✗ | ✗ | ✗ | ✗ | Species or species habitat may occur within area | |
| Australian Fairy Tern | *Sternula nereis nereis* | VU | VU | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |
| Red Knot, Knot | *Calidris canutus* | VU MI | EN | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat known to occur within area | |
| Northern Giant Petrel | *Macronectes halli* | VU MI | MI | ✗ | ✗ | ✗ | ✗ | Species or species habitat may occur within area | |
| White-capped Albatross | *Thalassarche steadi* | VU MI | - | ✗ | ✗ | ✗ | ✗ | Species or species habitat may occur within area | |
| Black-browed Albatross | *Thalassarche melanophris* | VU MI | EN | ✗ | ✗ | ✗ | ✗ | Species or species habitat may occur within area | |
| Australian Lesser Noddy | *Anous tenuirostris melanops* | VU | EN | ✗ | ✗ | ✗ | ✗ | Foraging, feeding or related behaviour known to occur within area | |
| Grey Falcon | *Falco hypoleucos* | VU | VU | ✗ | ✗ | ✗ | ✗ | Species or species habitat known to occur within area | |
| Asian Dowitcher | *Limnodromus semipalmatus* | VU MI | MI | ✗ | ✗ | ✗ | ✗ | Species or species habitat known to occur within area | |
| Indian Yellow-nosed Albatross | *Thalassarche carteri* | VU MI | EN | ✗ | ✗ | ✗ | ✗ | Species or species habitat may occur within area | |
| Campbell Albatross, Campbell Black-browed Albatross | *Thalassarche impavida* | VU MI | VU | ✗ | ✗ | ✗ | ✗ | Species or species habitat may occur within area | |
| Osprey | *Pandion haliaetus* | MI | MI | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |
| Brown Booby | *Sula leucogaster* | MI | MI | ✗ | ✗ | Breeding known to occur within area | ✗ | Breeding known to occur within area | |
| Masked Booby | *Sula dactylatra* | MI | MI | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |
| Red-footed Booby | *Sula sula* | MI | MI | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |
| Red-tailed Tropicbird | *Phaethon rubricauda* | MI | P4 MI | ✗ | ✗ | Species or species habitat likely to occur within area | ✗ | Breeding known to occur within area | |
| Oriental Plover, Oriental Dotterel | *Charadrius veredus* | MI | MI | ✗ | ✗ | ✗ | ✗ | Roosting known to occur within area | |

| Value/sensitivity | | Conservation Status | | Presence in OAs | | | | Presence in EMBA | Relevant Activities/Events |
|---|---|---|---|---|---|---|---|---|---|
| Common name | Scientific name | EPBC Act | BC Act | Ara | Curie | Mestrel/Bancroft | Wallace | | |
| Flesh-footed Shearwater, Fleshy-footed Shearwater | *Ardenna carneipes* | MI | VU | ✗ | ✗ | ✗ | ✗ | Foraging, feeding or related behaviour likely to occur within area | |
| Pectoral Sandpiper | *Calidris melanotos* | MI | MI | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat known to occur within area | |
| Bridled Tern | *Onychoprion anaethetus* | MI | MI | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |
| Little Tern | *Sternula albifrons* | MI | MI | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |
| Roseate Tern | *Sterna dougallii* | MI | MI | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |
| Fork-tailed Swift | *Apus pacificus* | MI | MI | ✗ | ✗ | ✗ | ✗ | Species or species habitat likely to occur within area | |
| Streaked Shearwater | *Calonectris leucomelas* | MI | MI | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat known to occur within area | |
| Lesser Frigatebird, Least Frigatebird | *Fregata ariel* | MI | MI | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Breeding known to occur within area | |
| White-tailed Tropicbird | *Phaethon lepturus* | MI | MI | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Species or species habitat likely to occur within area | Breeding known to occur within area | |
| Great Frigatebird, Greater Frigatebird | *Fregata minor* | MI | MI | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Foraging, feeding or related behaviour likely to occur within area | |
| Common Sandpiper | *Actitis hypoleucos* | MI | MI | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat known to occur within area | |
| Red-rumped Swallow | *Cecropis daurica* | MI | MI | ✗ | ✗ | ✗ | ✗ | Species or species habitat may occur within area | |
| Common Noddy | *Anous stolidus* | MI | MI | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat may occur within area | Species or species habitat likely to occur within area | |
| Oriental Pratincole | *Glareola maldivarum* | MI | MI | ✗ | ✗ | ✗ | ✗ | Roosting known to occur within area | |
| Bar-tailed Godwit | *Limosa lapponica* | MI | MI | ✗ | ✗ | ✗ | ✗ | Species or species habitat known to occur within area | |
| Wedge-tailed Shearwater | *Ardenna pacifica* | MI | MI | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |
| Greater Crested Tern | *Thalasseus bergii* | MI | MI | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |
| Caspian Tern | *Hydroprogne caspia* | MI | MI | ✗ | ✗ | ✗ | ✗ | Breeding known to occur within area | |

*Notes:*

*Conservation status is presented as the relevant EPBC Act and BC Act conservation codes (CR = Critically endangered; EN = Endangered; VU = Vulnerable; CD = Conservation dependent; MI = Migratory; P1 = Priority 1; P2 = Priority 2; P3 = Priority 3; P4 = Priority 4). Where a species has more than one conservation code, both codes are provided.*

*Presence data is presented as absence (denoted by the symbol ✗) or as presence type where the species was identified as potentially present within the relevant boundary.*

#### 3.2.6.1 Biologically Important Areas and Critical Habitat

Biologically Important Areas (BIAs) are areas that have been identified where threated or migratory species protected under the EPBC Act carry out critical lifecycle activities.

These BIAs are present in the OAs:

- flatback turtle (internesting buffer): Mestrel/Bancroft OA
- lesser frigatebird (reproduction): Curie OA, Mestrel/Bancroft OA and Wallace OA
- white-tailed tropicbird (reproduction): Ara OA, Curie OA, and Wallace OA
- brown booby (reproduction): Mestrel/Bancroft OA
- whale shark (feeding): all OAs.

Table 3-10 identifies the BIAs for marine fauna species in the OAs and the EMBA. Figure 3-9 to Figure 3-18 show the BIAs in and adjacent to the OAs and the EMBA. Further descriptions of these BIAs are provided in Appendix C.

##### *3.2.6.1.1 Habitat Critical to the Survival of a Species*

In addition to BIAs, habitat critical to the survival of species has been identified for marine turtles. Habitat critical to the survival of species is defined by the *EPBC Act Significant Impact Guidelines 1.1 Matters of National Environmental Significance* as:

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

*The Recovery Plan for Marine Turtles in Australia 2017–2027* (Commonwealth of Australia, 2017) identifies habitat critical to the survival of a species for marine turtles as:

- nesting habitat critical to the survival of green, loggerhead, flatback and hawksbill turtles includes at least 70 per cent of nesting for the stock.
- nesting habitat critical to the survival of olive ridley turtles includes all documented nesting areas in Queensland and Western Australia, and beaches where nesting has been recorded with greater than ten nesting females in the Northern Territory (noting inter-annual fluctuations).
- nesting habitat critical to the survival of leatherback turtles includes all areas where nesting has occurred in Australia since 1996.
- nesting habitat critical to survival of marine turtles is of a geographically relevant scale. For example, green turtles are known to move between islands of the Capricorn Bunker Group within a nesting season, while leatherback turtles may move up to 400 km within a season.
- where relevant, nesting habitat determined to be critical to the survival of marine turtles includes areas that are: geographically dispersed; major and minor rookeries; mainland and island beaches; and winter or summer nesting.
- to ensure the validity of long-term monitoring programs for assessing trends in nesting turtle abundance, all index beaches are considered habitat critical to survival of marine turtles.
- internesting habitat critical to the survival of marine turtles is located immediately seaward of designated nesting habitat critical to the survival of marine turtles. The internesting habitat critical buffer for green, loggerhead, hawksbill, olive ridley and leatherback turtles is 20 km and 60 km for flatback turtles.

No habitat critical to the survival of marine turtles occurs within the OAs. Habitat critical to the survival of marine turtles within the EMBA are described in Table 3-10 and shown in Figure 3-14 to Figure 3-17.

**Table 3-10: BIAs and habitat critical to survival identified in the combined OA and environment that may be affected**

| Fauna group | Species | BIA Type | Presence in OA | | | | Presence in EMBA | Habitat Critical within EMBAs |
|---|---|---|---|---|---|---|---|---|
| | | | Ara | Curie | Mestrel/Bancroft | Wallace | | |
| Sharks and Rays | Whale shark | Feeding | ✓ | ✓ | ✓ | ✓ | ✓ | N/A |
| | | Feeding (high density prey) | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Dwarf sawfish | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Freshwater sawfish | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Green sawfish | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| Marine Mammals | Pygmy Blue Whale | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | N/A |
| | | Migration | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Humpback Whale | Resting | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Migration | ✗ | ✗ | ✓ | ✗ | ✓ | |
| | Dugong | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| Marine Reptiles | Loggerhead Turtle | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | Nesting |
| | | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Hawksbill Turtle | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | Nesting |
| | | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Migration | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Green Turtle | Aggregation | ✗ | ✗ | ✗ | ✗ | ✓ | Nesting |
| | | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Migration | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Flatback turtle | Aggregation | ✗ | ✗ | ✗ | ✗ | ✓ | Nesting |

| Fauna group | Species | BIA Type | Presence in OA | | | | Presence in EMBA | Habitat Critical within EMBAs |
|---|---|---|---|---|---|---|---|---|
| | | | Ara | Curie | Mestrel/Bancroft | Wallace | | |
| | | Reproduction | ✗ | ✗ | ✓ | ✗ | ✓ | |
| | | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Migration | ✗ | ✗ | ✗ | ✗ | ✓ | |
| Marine Birds | Lesser Frigatebird | Reproduction | ✗ | ✓ | ✓ | ✗ | ✓ | N/A |
| | Bridled Tern | Feeding (in high numbers) | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Brown Booby | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Fairy Tern | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Greater Frigatebird | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Lesser Crested Tern | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Lesser Frigatebird | Reproduction | ✗ | ✗ | ✓ | ✓ | ✓ | |
| | Little Shearwater | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Little Tern | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Resting | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Roseate Tern | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Sooty Tern | Feeding | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Wedge-tailed Shearwater | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | | Feeding (in high numbers) | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | Red-footed booby | Reproduction | ✗ | ✗ | ✗ | ✗ | ✓ | |
| | White-tailed Tropicbird | Reproduction | ✓ | ✓ | ✗ | ✓ | ✓ | |

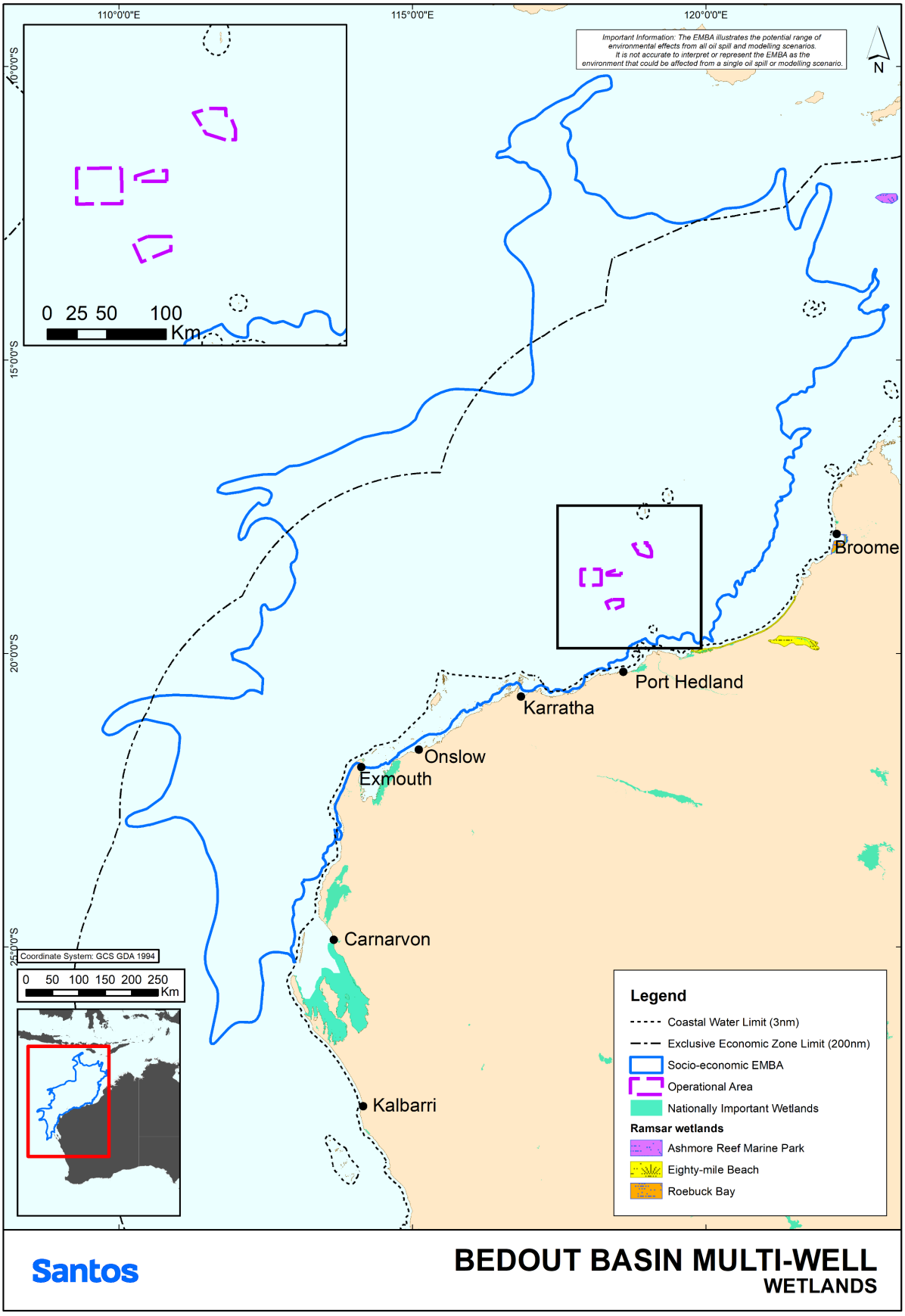



**Figure 3-9: BIAs for whale sharks in the vicinity of the OAs and the environment that may be affected**

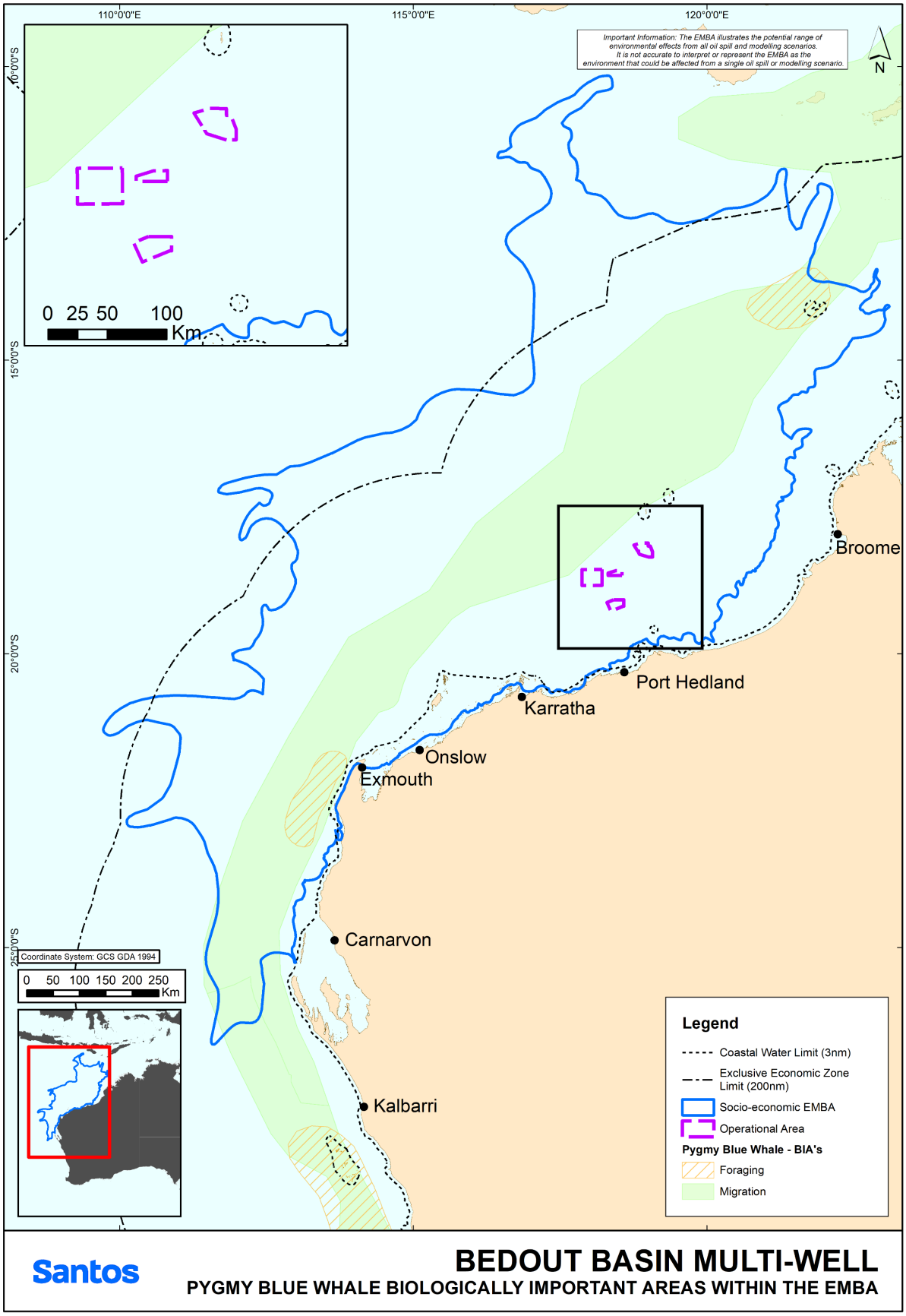



**Figure 3-10: BIAs for pygmy blue whales in the vicinity of the OAs and the environment that may be affected**

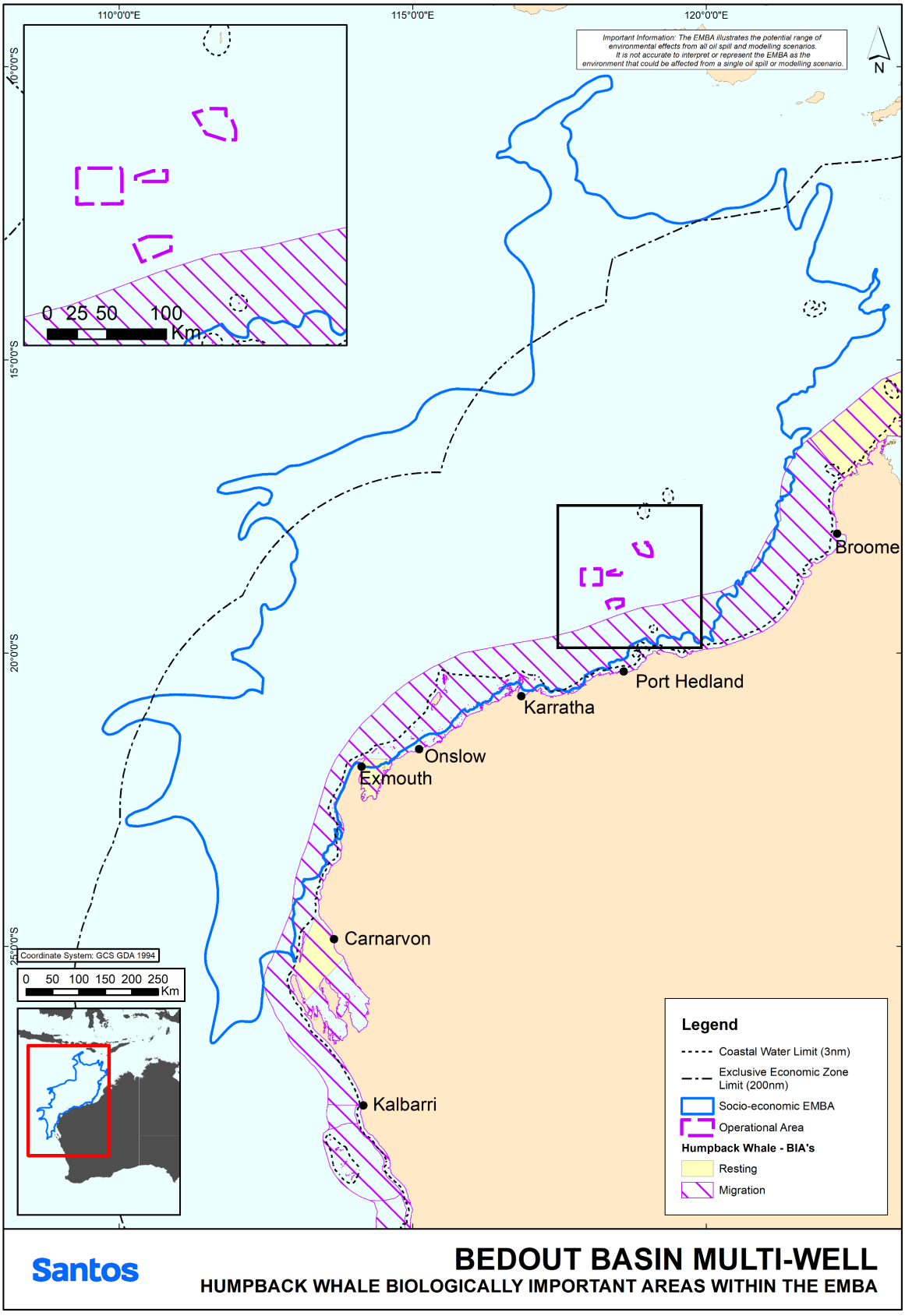



**Figure 3-11: BIAs for humpback whales in the vicinity of the OAs and the environment that may be affected**

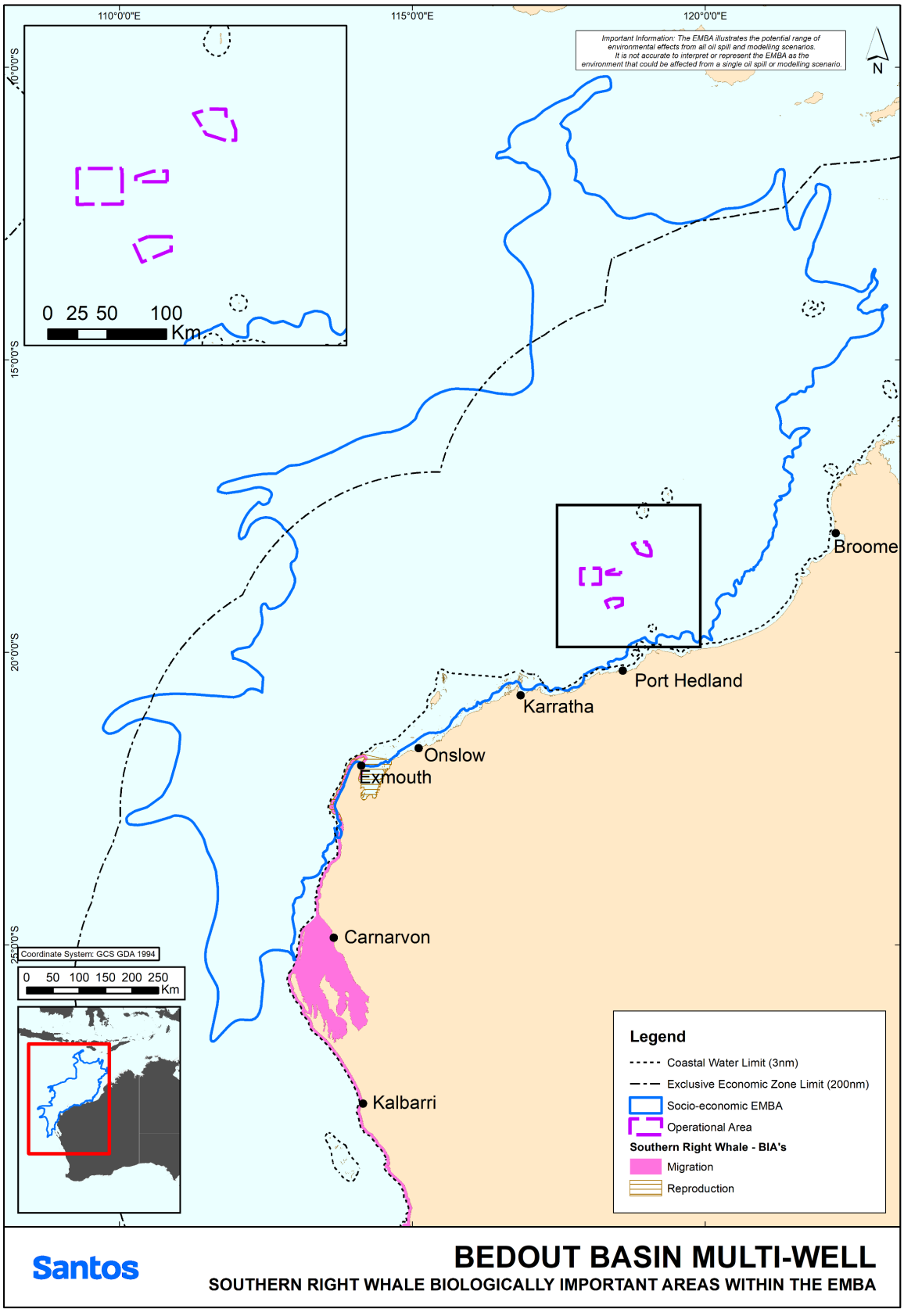



**Figure 3-12: BIAs for southern right whales in the vicinity of the OAs and the environment that may be affected**

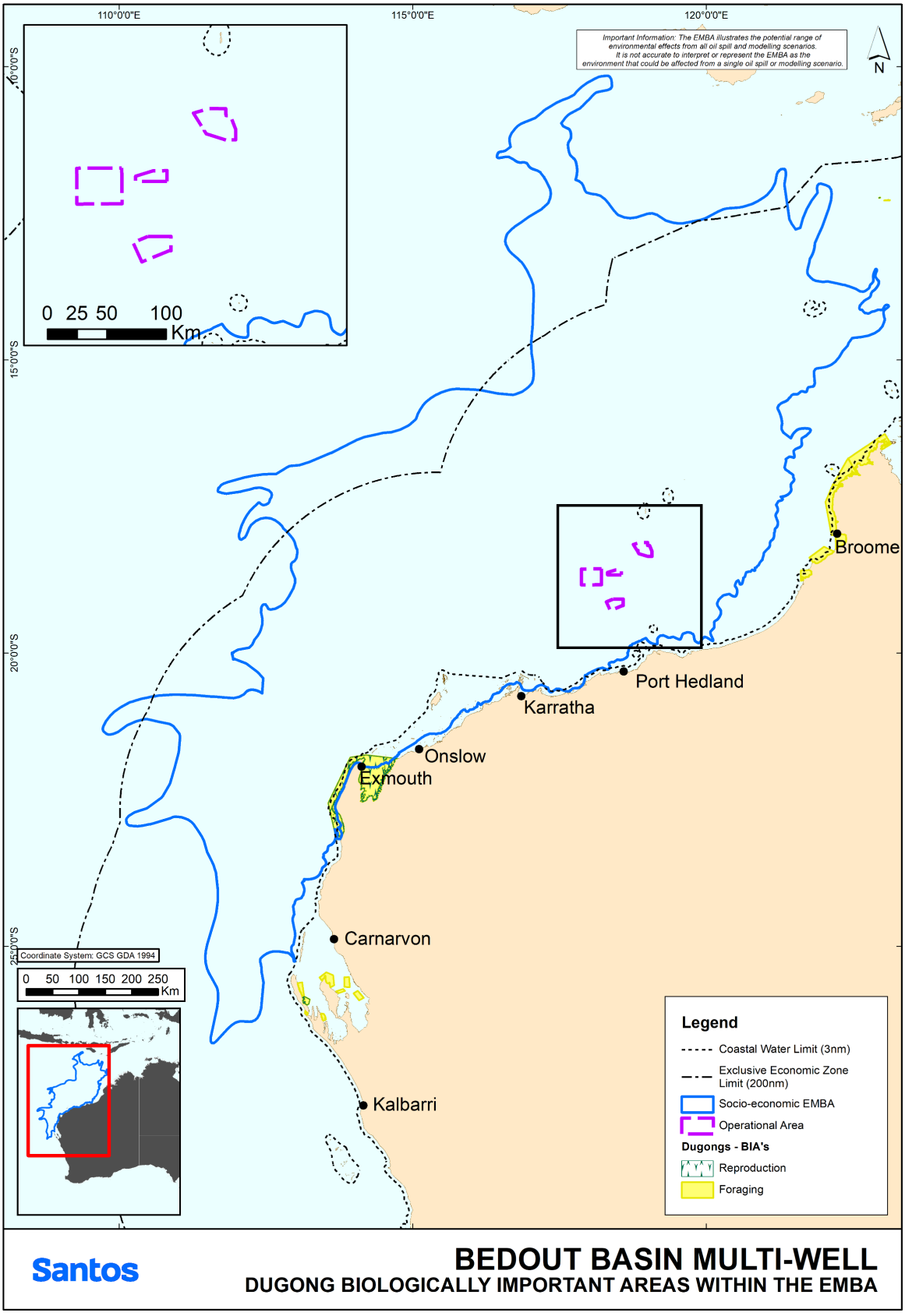



**Figure 3-13: BIAs for dugongs in the vicinity of the OAs and the environment that may be affected**

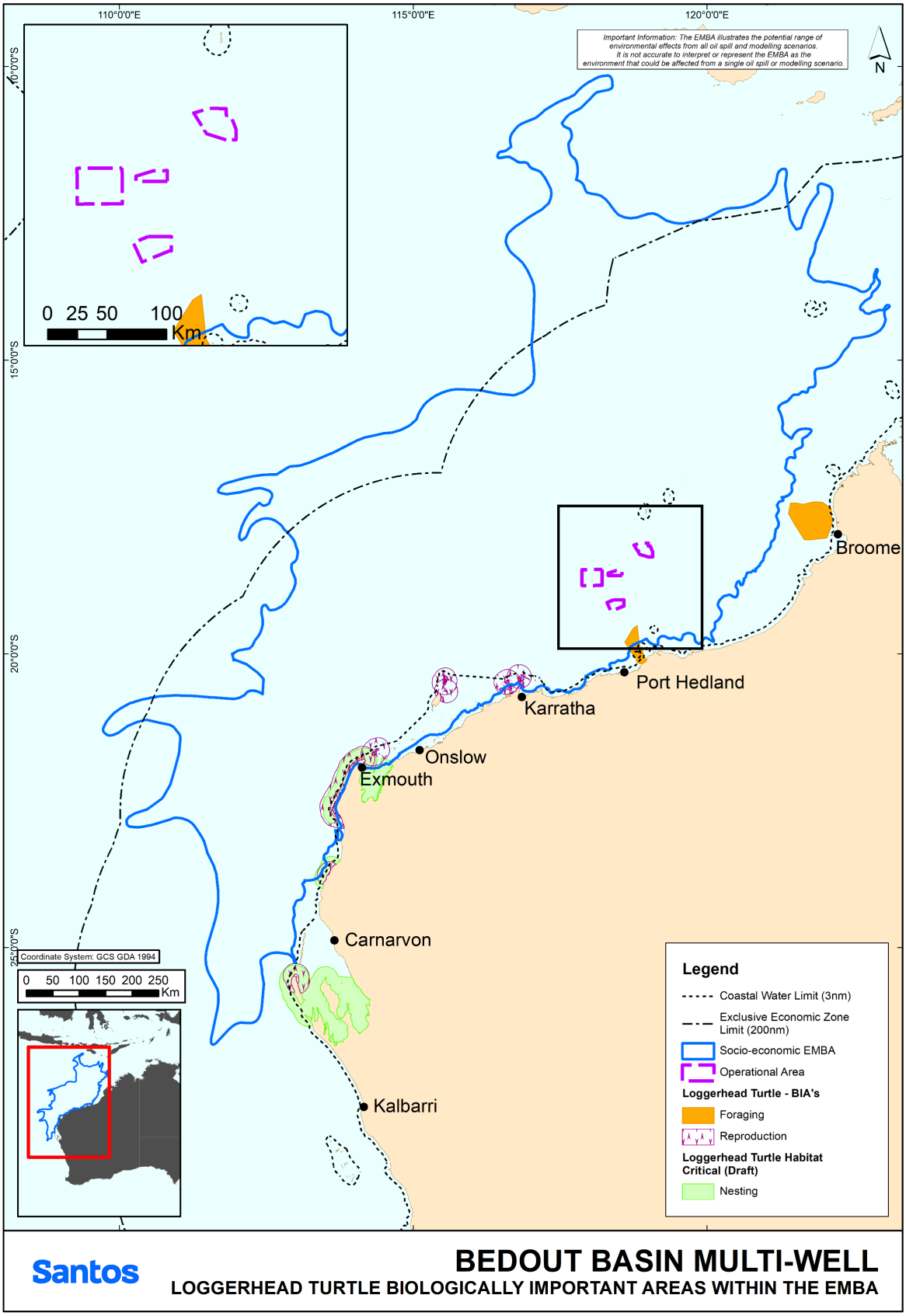



**Figure 3-14: BIAs for loggerhead turtles in the vicinity of the OAs and the environment that may be affected**

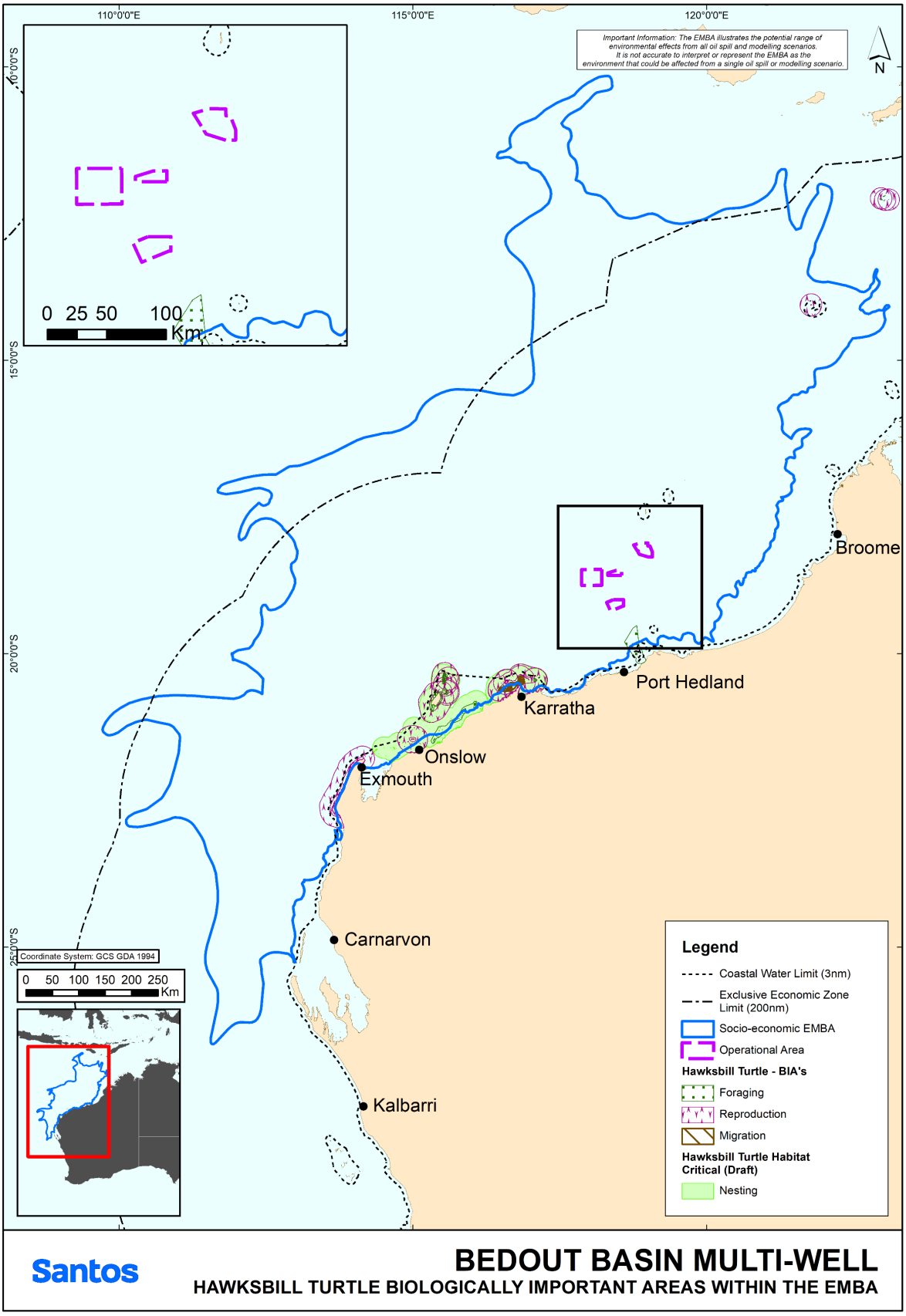



**Figure 3-15: BIAs for hawksbill turtles in the vicinity of the OAs and the environment that may be affected**

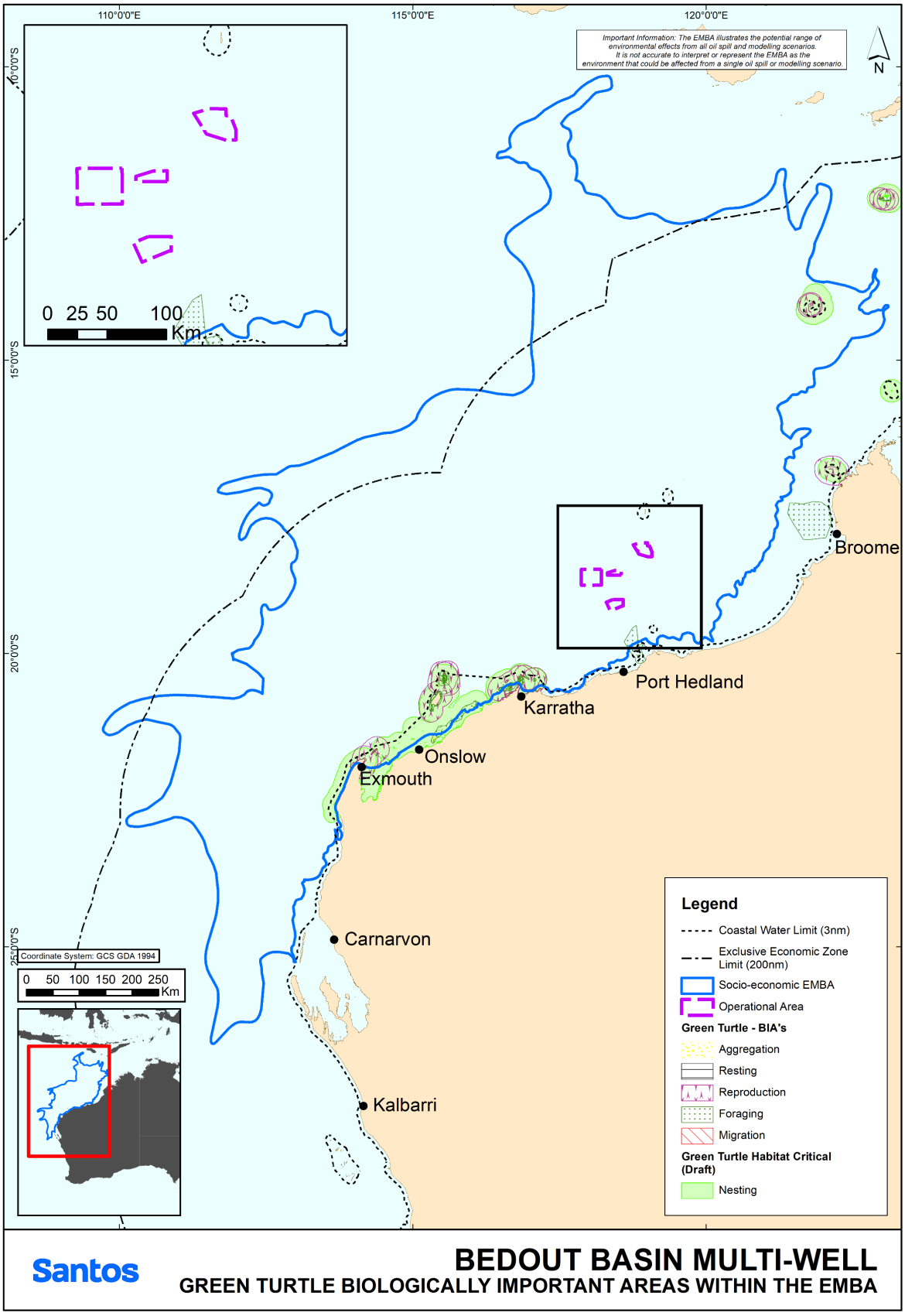



**Figure 3-16: BIAs areas for green turtles in the vicinity of the OAs and the environment that may be affected**

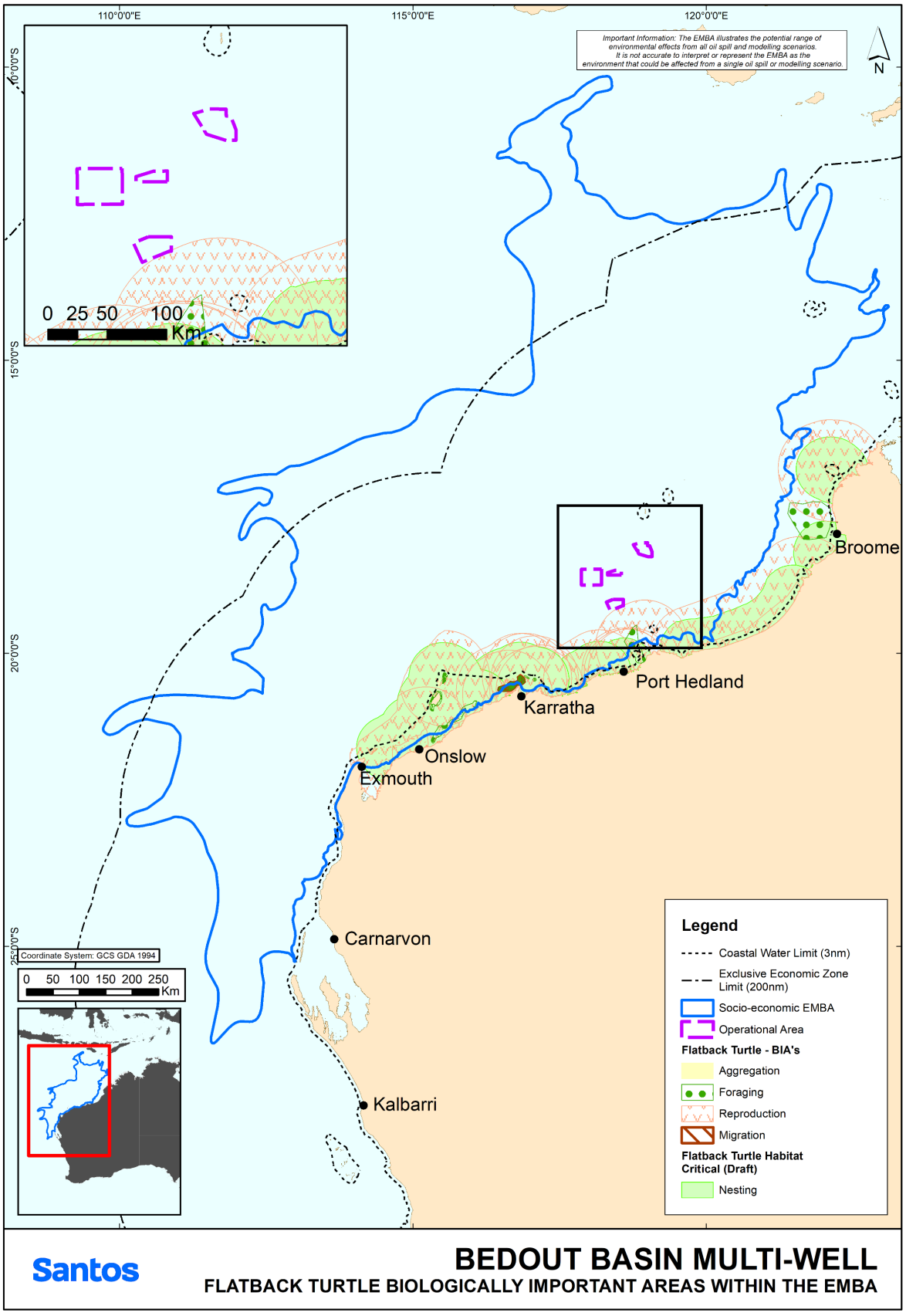



**Figure 3-17: BIAs for flatback turtles in the vicinity of the OAs and the environment that may be affected**

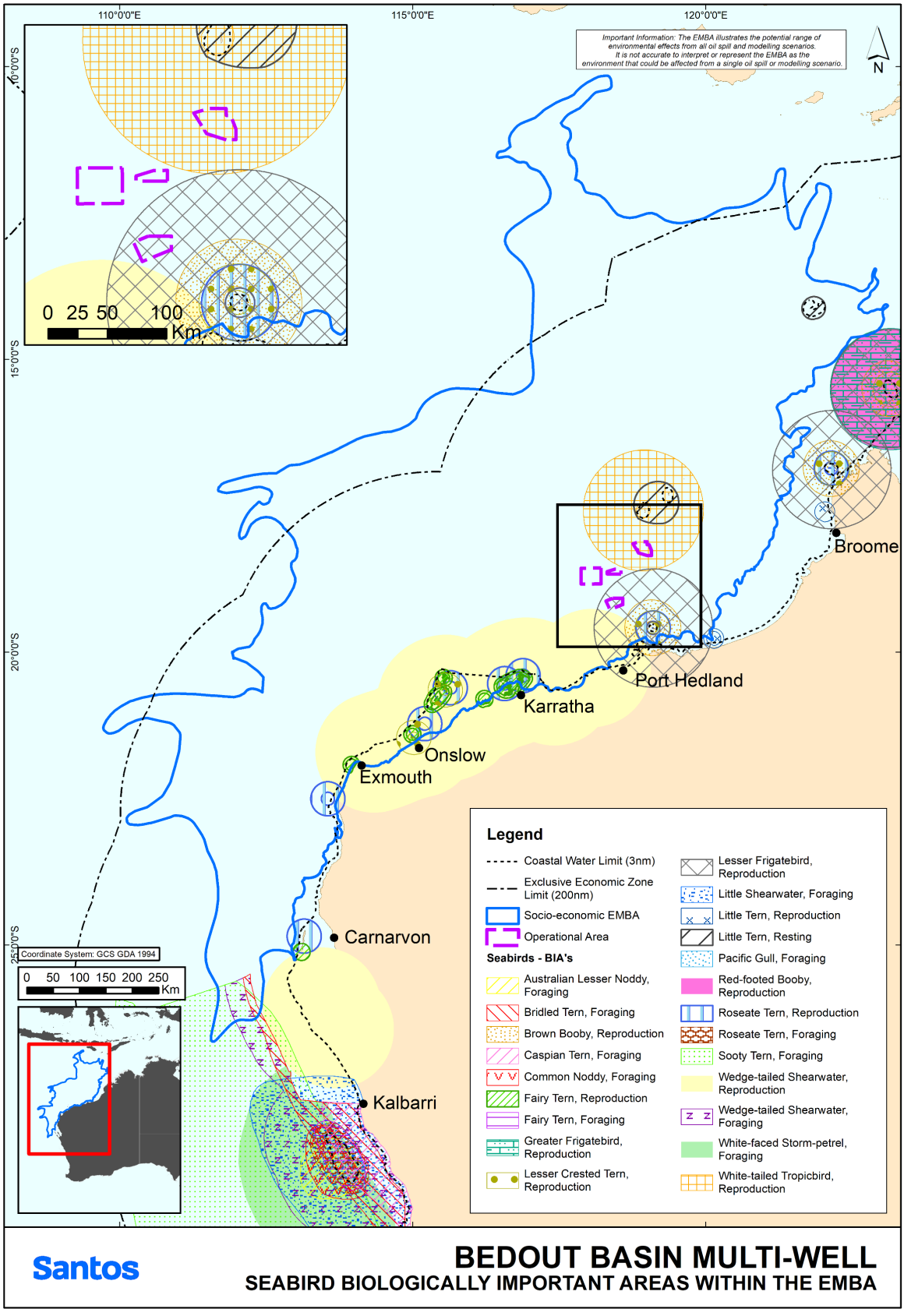



**Figure 3-18: BIAs for seabirds in the vicinity of the OAs and the environment that may be affected**

### 3.2.6.2 Recovery Plans, Conservation Advice and Species Management Plans

To support the protection of Threatened and Migratory species, a series of recovery plans, conservation advice and species management plans have been developed by the Commonwealth of Australia. These documents identify threats to the specific species they are associated with and, in some cases, recommend conservation actions that should be undertaken to protect that species.

Table 3-11 summarises the recovery plans, conservation advice and species management plans relevant to the threatened and migratory species that have been identified as potentially occurring within the OAs and the EMBA.

Table 3-11 also identifies the actions within these documents that are relevant to the Activity.

**Table 3-11: Relevant threats identified in recovery plans, conservation advice and management plans for species that occur or may occur within the OA and EMBA**

| Name | Recovery Plan/ Conservation Advice/Management Plan | Threats/Strategies identified as relevant to the Activity | Relevant Conservation Actions | Addressed (where relevant) in EP section |
|---|---|---|---|---|
| **All Fauna** | | | | |
| All vertebrate fauna | Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (Commonwealth of Australia, 2018a) | Marine debris | No explicit management actions for non-fisheries related industries – management actions predominantly related to management of wastes. | 7.1 |
| **Fish and Sharks** | | | | |
| All sawfish and river sharks | Sawfish and River Sharks Multispecies Recovery Plan (Commonwealth of Australia, 2015a) | Habitat degradation and modification | Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks. | 7.6, 7.7 |
| Freshwater sawfish | Approved Conservation Advice for *Pristis pristis* (largetooth sawfish) (DCCEEW, 2025). | | | |
| Green sawfish | Commonwealth Conservation Advice on *Pristis zijsron* (green sawfish) (TSSC, 2008a) | | | |
| Dwarf sawfish | Approved Conservation Advice for Pristis clavata (dwarf sawfish) (DEWHA, 2009) | | | |
| Great white shark | Recovery plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC, 2013a) | Ecosystem effects as a result of habitat modification and climate change | No explicit relevant management actions. | Not relevant to activities |
| Grey nurse shark | Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (DoE, 2014) | Pollution and disease | Review and assess the potential threat of introduced species, pathogens and pollutants. | 7.6, 7.7 |
| | | Ecosystem effects – habitat modification and climate change | Review the level and spatial extent of protection measures at key aggregation sites to ensure appropriate levels of protection, and a consistent approach to the designation and implementation of protective measures, are applied.<br>Use BIAs to help inform the development of appropriate conservation measures, including through the application of advice in the marine bioregional plans on the types of actions which are likely to have a significant impact on the species and updating such conservation measures as new information becomes available. | 7.6, 7.7 |
| | | Ecosystem effects – climate change | No explicit relevant management actions. | Not relevant to activities |

| Name | Recovery Plan/ Conservation Advice/Management Plan | Threats/Strategies identified as relevant to the Activity | Relevant Conservation Actions | Addressed (where relevant) in EP section |
|---|---|---|---|---|
| Whale shark | Approved Conservation Advice for *Rhincodon typus* (whale shark) (TSSC, 2015f) | Vessel strike, habitat modification | Minimise offshore developments and transit time of large vessels in areas close to marine features likely to correlate with Whale Shark aggregations along the northward migration route.<br>Implement measures to reduce adverse impacts of habitat degradation and/or modification. | 7.6, 7.7 |
| **Marine Mammals** | | | | |
| Blue whale | Conservation Management Plan for the Blue Whale (Commonwealth of Australia, 2015e) | Noise interference, habitat modification, vessel strike, marine debris, pollution, climate change and variability | Improving management and understanding of impacts anthropogenic noise may have on blue whales by:<br>• investigating baseline acoustic behaviour of blue whales<br>• assessing the effect of anthropogenic noise on blue whale behaviour<br>• managing anthropogenic noise in BIAs such that blue whales continue to use the area without injury or displacement<br>• applying EPBC Act Policy Statement 2.1 to seismic exploration surveys<br>• ensuring behavioural impacts are considered<br>• minimising vessel collisions by:<br>– developing national vessel strike strategy<br>– reporting all vessel strike incidents in the National Ship Strike Database<br>– considering risk of vessel strikes on blue whales when assessing actions increasing vessel traffic in areas where the species occurs and, if required, appropriate mitigation measures are implemented. | 6.4, 6.5 7.1, 7.3, 7.4, 7.6, 7.7, 7.8 |
| | Guidance on key terms within the Blue Whale Conservation Management Plan (DAWE, 2021) | Vessel disturbance | Minimise vessel collisions by:<br>• developing national vessel strike strategy<br>• reporting all vessel strike incidents in the National Ship Strike Database<br>• considering risk of vessel strikes on blue whales when assessing actions increasing vessel traffic in areas where the species occurs and, if required, appropriate mitigation measures are implemented. | 7.3 |

| Name | Recovery Plan/ Conservation Advice/Management Plan | Threats/Strategies identified as relevant to the Activity | Relevant Conservation Actions | Addressed (where relevant) in EP section |
|---|---|---|---|---|
| Fin whale | Approved Conservation Advice for *Balaenoptera physalus* (fin whale) (TSSC, 2015d) | Noise interference, vessel strike, marine debris | Once the spatial and temporal distribution (including biologically important areas) of Fin Whales is further defined, assess the impacts of increasing anthropogenic noise (including seismic surveys, port expansion, and coastal development).<br>Minimise vessel collisions by:<br>• developing national vessel strike strategy<br>• reporting all vessel strike incidents in the National Ship Strike Database<br>• ensuring risk of vessel strikes on fin whales is considered when assessing actions that increase vessel traffic in areas where the species occurs and, if required, appropriate mitigation measures are implemented. | 6.4, 7.1, 7.3 |
| Sei whale | Approved Conservation Advice for *Balaenoptera borealis* (sei whale) (TSSC, 2015e) | Noise interference, vessel strike | Once the spatial and temporal distribution (including biologically important areas) of Sei Whales is further defined, assess the impacts of increasing anthropogenic noise (including seismic surveys, port expansion, and coastal development). | 6.4, 7.3 |
| Southern Right Whale | National Recovery Plan for the Southern Right Whale (*Eubalaena australis*) (DCCEEW, 2024a) | Anthropogenic underwater noise, pollution, habitat degradation, vessel strike, prey depletion from seismic surveys.<br>Climate variability and anthropogenic climate change | Current information on species' occurrence used to inform planning, assessment, and decision-making.<br>Activities within/adjacent to southern right whale BIAs should demonstrate that noise does not prevent any southern right whale from utilising the area or cause auditory impairment.<br>Environmental assessments consider:<br>• national policy and guidelines related to anthropogenic underwater noise and mitigation measures<br>• risk of vessel strike and mitigation measures. | 6.4, 6.5, 7.1, 7.3, 7.4, 7.6, 7.7, 7.8 |
| **Marine Reptiles** | | | | |
| All marine turtles | National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DCCEEW, 2023a) | Light pollution | Best practise lighting design which incorporates the following design principles:<br>• start with natural darkness and add lighting for specific purposes<br>• use adaptive light controls to manage light timing, intensity and colour<br>• light only the object/area intended by keeping lights close to the ground, directed | 6.3 |

| Name | Recovery Plan/ Conservation Advice/Management Plan | Threats/Strategies identified as relevant to the Activity | Relevant Conservation Actions | Addressed (where relevant) in EP section |
|---|---|---|---|---|
| | | | towards the intended area and/or shielding lights to prevent light spill<br>• use the lowest intensity lighting appropriate for the purpose<br>• use non-reflective dark coloured surfaces<br>• use lights with reduced or filtered blue, violet and ultra-violet wavelengths. | |
| | Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017) | Climate change and variability | No explicit relevant management actions. | 6.5 |
| | | Marine debris | Reduce impacts from marine debris.<br>Support the implementation of the EPBC Act Threat Abatement Plan for the impacts of marine debris on vertebrate marine life. | 7.1 |
| | | Vessel disturbance | No specific management actions in relation to vessels prescribed in the plan. | 7.3 |
| | | Light pollution | Minimise light pollution by:<br>• managing artificial light within or adjacent to habitat critical to the survival of marine turtles such that marine turtles are not displaced from these habitats<br>• developing and implementing best practice light management guidelines for existing and future developments adjacent to marine turtle nesting beaches<br>• identifying the cumulative impact on turtles from multiple sources of onshore and offshore light pollution. | 6.3 |
| Dusky sea snake | Conservation Advice for *Aipysurus fuscus* (dusky sea snake) (DCCEEW, 2024b) | Oil spills and pollution, anthropogenic marine noise | Consideration of the Scott Reef complex as a critical area for protection of the dusky sea snake.<br>Avoid seismic noise within/adjacent to reefs and shoals where the dusky sea snake is known or likely to occur.<br>Oil spill response strategies in place. | 6.4, 7.1, 7.4, 7.6, 7.7, 7.8 |
| Leaf scale sea snake | Approved Conservation Advice for *Aipysurus foliosquama* (Leaf-scaled Sea Snake) (TSSC, 2010a) | Habitat degradation and modification | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| Short-nosed sea snake | Approved Conservation Advice for *Aipysurus apraefrontalis* (Short nosed Sea Snake) (TSSC, 2010b) | Habitat degradation and modification | Monitor known populations to identify key threats.<br>Ensure there is no anthropogenic disturbance in areas where the species occurs, excluding necessary actions to manage the conservation of the species. | 7.1, 7.4, 7.6, 7.7, 7.8 |

| Name | Recovery Plan/ Conservation Advice/Management Plan | Threats/Strategies identified as relevant to the Activity | Relevant Conservation Actions | Addressed (where relevant) in EP section |
|---|---|---|---|---|
| **Seabirds** | | | | |
| All migratory shorebirds and seabirds | National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (DCCEEW, 2023a) | Light pollution | Best practise lighting design that incorporates these design principles:<br>• start with natural darkness and add lighting for specific purposes<br>• use adaptive light controls to manage light timing, intensity and colour<br>• light only the object/area intended by keeping lights close to the ground, directed towards the intended area and/or shielding lights to prevent light spill<br>• use the lowest intensity lighting appropriate for the purpose<br>• use non-reflective dark coloured surfaces<br>• use lights with reduced or filtered blue, violet and ultra-violet wavelengths. | 6.3 |
| All migratory shorebirds | Wildlife Conservation Plan for Migratory Shorebirds (Commonwealth oof Australia, 2015c) | Anthropogenic disturbance | Ensure all areas of important habitat for migratory shorebirds are considered in the development assessment process.<br>Manage the effects of anthropogenic disturbance to migratory shorebird breeding and roosting areas. | 6.3, 6.4, 7.1, 7.4, 7.6, 7.7, 7.8 |
| All seabirds | Wildlife Conservation Plan for Seabirds (Commonwealth of Australia, 2020) | Habitat modification, marine debris | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| All albatross and petrels | Threat Abatement Plan for the Incidental Catch (or Bycatch) of Seabirds During Oceanic Longline Fishing Operations (Commonwealth of Australia, 2018b) | Direct mortality from pollution and contamination. | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| | National Recovery Plan for Albatrosses and Petrels (Commonwealth of Australia, 2022) | Habitat degradation and modification, pollution and contamination. | | |
| Abbotts booby | Conservation Advice for Abbott's Booby – *Papasula abbotti* (TSSC, 2020b) | Habitat degradation and modification, pollution and contamination. | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| Asian dowitcher | Conservation Advice for *Limnodromus semipalmatus* (Asian dowitcher) (DCCEEW, 2024c) | Pollution | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| Australian Fairy Tern | Commonwealth Conservation Advice on | Habitat degradation and modification, | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |

| Name | Recovery Plan/ Conservation Advice/Management Plan | Threats/Strategies identified as relevant to the Activity | Relevant Conservation Actions | Addressed (where relevant) in EP section |
|---|---|---|---|---|
| | *Sternula nereis nereis* (Fairy Tern) (TSSC, 2011) | pollution and contamination. | | |
| Australian lesser noddy | Conservation Advice *Anous tenuirostris melanops* (Australian lesser noddy) (Commonwealth of Australia, 2015d) | Habitat loss, disturbance and modification | Reduce human disturbance at the Houtman Abrolhos. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| Australian painted snipe | Approved Conservation Advice for *Rostratula australis* (Australian Painted Snipe) (TSSC, 2013) | Habitat degradation and modification, pollution and contamination. | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| | National Recovery Plan for the Australian Painted Snipe (*Rostratula australis*) (CoA, 2022) | Habitat degradation and modification, pollution and contamination. | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| Christmas Island white-tailed tropicbird, golden bosunbird | Conservation Advice *Phaethon lepturus fulvus* white-tailed tropicbird (Christmas Island) (TSSC, 2014) | Habitat degradation and modification, pollution and contamination. | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| Common greenshank | Conservation Advice for *Tringa nebularia* (common greenshank) (DCCEEW, 2024e) | Anthropogenic disturbance, pollution | No explicit relevant management actions. | 6.3, 6.4, 7.1, 7.4, 7.6, 7.7, 7.8 |
| Curlew Sandpiper | Conservation Advice for *Calidris ferruginea* (Curlew Sandpiper) (DCCEEW, 2023a) | Habitat degradation and modification, pollution and contamination. | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| Eastern curlew | Conservation Advice for *Numenius madagascariensis* (far eastern Curlew) (DCCEEW, 2023c) | Habitat degradation and modification, pollution and contamination. | No explicit relevant management actions. | 7.1, 7.4, 7.6, 7.7, 7.8 |
| Greater sand plover | Conservation Advice for *Charadrius leschenaultii* (greater sand plover) (DCCEEW, 2023b) | Anthropogenic disturbance, pollution | No explicit relevant management actions. | 6.3, 6.4, 7.1, 7.4, 7.6, 7.7, 7.8 |
| Northern Siberian bar-tailed godwit | Conservation Advice for *Limosa lapponica menzbieri* (Yakutian bar-tailed Godwit) (TSSC, 2016e) | Anthropogenic disturbance, habitat degradation and modification, pollution and contamination. | Ensure all areas of important habitat for migratory shorebirds are considered in the development assessment process.<br>Manage the effects of anthropogenic disturbance to migratory shorebird breeding and roosting areas. | 6.3, 6.4, 7.1, 7.4, 7.6, 7.7, 7.8 |
| Red knot | Approved Conservation Advice for *Calidris canutus* (Red knot) (DCCEEW, 2024b) | Habitat degradation and modification, pollution and contamination. | No explicit relevant management actions. | 6.3, 6.4, 7.1, 7.4, 7.6, 7.7, 7.8 |
| Ruddy turnstone | Conservation Advice for *Arenaria interpres* (ruddy turnstone) (DCCEEW, 2024i) | Anthropogenic disturbance, pollution | No explicit relevant management actions. | 6.3, 6.4, 7.1, 7.4, 7.6, 7.7, 7.8 |

| Name | Recovery Plan/ Conservation Advice/Management Plan | Threats/Strategies identified as relevant to the Activity | Relevant Conservation Actions | Addressed (where relevant) in EP section |
|---|---|---|---|---|
| Sharp-tailed sandpiper | Conservation Advice for *Calidris acuminata* (sharp-tailed sandpiper) (DCCEEW, 2024a | Habitat degradation and modification, pollution and contamination. | No explicit relevant management actions. | 6.3, 6.4, 7.1, 7.4, 7.6, 7.7, 7.8 |
| Shy albatross | Conservation Advice *Thalassarche cauta* (Shy Albatross) (CoA, 2020b) | No explicit relevant threats | No explicit relevant management actions. | Not relevant to activities |

## 3.2.7 Socio-economic Receptors

### 3.2.7.1 Cultural Features

#### *3.2.7.1.1 Introduction*

Santos acknowledges the tradition of the First Nations people of Australia includes a cultural and spiritual connection to their land and waters, including sea country. These connections are rooted in their traditional communal beliefs and practices. First Nations people view their land and waters as integral to their identity, culture, and spirituality and they have a deep respect for the natural world.

The cultural heritage of First Nations peoples includes a vast array of tangible and intangible cultural artifacts, practices, and beliefs. The protected heritage of First Nations peoples is also of cultural value to Australia and the global community. The cultural value of First Nations protected heritage to Australia is evidenced and given force by a range of factors, including the laws, regulations and institutions established across Australia that are designed specifically to protect First Nations rights and interests in relation to sacred sites and other aspects of First Nations cultural heritage.

For First Nations Indigenous People, Country is a combination of the land, sea, rivers, and islands and all that they contain and sustain. '*Country refers to more than just a geographical area: it is shorthand for all the values, places, resources, stories and cultural obligations associated with that geographical area*.' (Smyth, 2007).

It is recognised that spiritual corridors extend from terrestrial areas into nearshore and offshore waters, that a number of marine animals are totems for Indigenous people.

Aboriginal people use and actively manage the coastal and marine environments as a resource and to maintain cultural identity, health, and wellbeing. Fishing, hunting and the maintenance of culture and heritage through ritual, stories and traditional knowledge continue as important uses of nearshore and adjacent areas.

First Nations people in north-west WA continue to rely on coastal and marine environments and resources of the region for their cultural identity, health and wellbeing, and their domestic and commercial economies (Smyth, 2007).

#### *3.2.7.1.2 Sea Country*

Sea country is described in State, Territory and Commonwealth Marine Park Management Plans. The Australian Marine Parks North-west Marine Parks Network Management Plan 2018 defines sea country as 'the areas of the sea that Aboriginal and Torres Strait Islander groups are particularly affiliated with through their traditional lore and customs' (DNP, 2018). Sea country is valued for Aboriginal cultural identity, health, and wellbeing.

The Australian Marine Park Management Plans (AMP) include the objective to provide for the protection and conservation of biodiversity and other natural, cultural and heritage values of marine parks. The plans define cultural values as 'living and cultural heritage recognising Indigenous beliefs, practices and obligations for country, places of cultural significance and cultural heritage sites' (DNP, 2018). Australian Marine Park Management Plans list the Aboriginal people who have responsibilities for sea country in the Marine Parks, and the Native Title Representative Body for the region.

Aboriginal people of north-western Australia have been sustainably using and managing their sea country for tens of thousands of years, in some cases since before rising sea levels created these marine environments (DNP, 2018).

A common feature of coastal Aboriginal cultures is the connectedness of land and sea: together they form a country of significant cultural sites and dreaming tracks of the creation ancestors (NOO, 2002). As a result, coastal environments are an integrated cultural landscape/seascape that is conceptually different from the broader Australian view of land and sea (NOO, 2002).

Animals can be totems for Aboriginal people. Aboriginal people share the land and water with animals and their relationship with totem animals is fundamental to continued practice and cultural responsibility; for food, health,

shelter, cultural expression, and spiritual wellbeing (VAHC, 2021). Caring for plants, animals and their habitats is therefore seen as a key way of expressing culture (VAHC, 2021).

As presented in Section 3.2.5.1, the marine parks within the EMBA are managed by the *Australian Marine Parks North-west Marine Parks Network Management Plan* (DNP, 2018a) and the *South-west Marine Parks Network Management Plan* (DNP, 2018b). The following information has been drawn from relevant Marine Parks Network Management Plans (DNP, 2018a) and has helped inform Santos' relevant person identification process outlined in Section 4.5.2.4. Refer Section 4.5.2.4 and Table 4-6 for which of the people/groups listed below have been consulted as relevant persons for this EP:

- Abrolhos AMP: The Nanda and Naaguja People have responsibilities for sea country in this AMP. The Yamatji Marlpa Aboriginal Corporation is the Native Title Representative Body for the Pilbara region;
- Dampier AMP: The Ngarluma, Yindjibarndi, Yaburara, and Mardudhunera people have responsibilities for sea country in this AMP. The native title holders for these people are represented by the Ngarluma Aboriginal Corporation and Yindjibarndi Aboriginal Corporation. The Yamatji Marlpa Aboriginal Corporation is the Native Title Representative Body for the Pilbara region;
- Eighty Mile Beach AMP: The Nyangumarta, Karajarri and Ngarla people have responsibilities for sea country in this AMP. The native title holders for these people are represented by the Karajarri Aboriginal Corporation, Nyangumarta Karajarri Aboriginal Corporation, Nyangumarta Warrarn Aboriginal Corporation, and Wanparta Aboriginal Corporation. The Kimberley Land Council is the Native Title Representative Body for the Kimberley region;
- Gascoyne AMP and Ningaloo AMP: The Gnulli people (collective for Yinggarda, Baiyungu and Thalanyji people) have responsibility for sea country in these AMPs;
- Kimberley AMP: Sea country for the Wunambal Gaambera, Dambimangari, Mayala, Bardi Jawi and the Nyul Nyul people overlap with this AMP, with native title determinations granted across parts of the AMP to the Wunambal Gaambera, Bardi Jawi, Mayala and the Nyul Nyul people. Native title holders are represented by the Wunambal Gaambera Aboriginal Corporation, Bardi and Jawi Niimidiman Aboriginal Corporation and the Kimberley Land Council. The Kimberley Land Council is the Native Title Representative Body for the Kimberley region;
- Roebuck AMP: The Yawuru people have responsibilities for the Roebuck Bay sea country. The native Title Representative Body for the AMP is the Yawuru Native Title Holders Aboriginal Corporation. The Kimberley Land Council is the Native Title Representative Body for the Kimberley region;
- Shark Bay AMP: The Gnulli (collective for Yinggarda, Baiyungu and Thalanyji people) and Malgana people have responsibilities for sea country within the AMP. The Yamatji Marlpa Aboriginal Corporation is the Native Title Representative Body for the Geraldton region;
- Argo-Rowley Terrace AMP, Ashmore Reef AMP, Carnarvon Canyon AMP, Mermaid Reef AMP and Montebello AMP: There is limited information about the cultural significance of these AMPs. The Kimberley Land Council is the Native Title Representative Body for the Kimberley region; and

The Representative Aboriginal and Torres Strait Islander Body (RATSIB) areas have been presented in relation to the OAs and EMBA in Figure 3-19.

These people/groups have been consulted, in some cases via representative prescribed body corporates, as outlined in Section 4.

#### *3.2.7.1.3 Indigenous Land Use Agreements and Native Title Claims and Determinations*

An Indigenous Land Use Agreement (ILUA) is a voluntary agreement between native title parties and other people or bodies about the use and management of areas of land and/or waters. An ILUA can be made over areas where:

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

While registered, ILUAs bind all native title holders to the terms of the agreement. ILUAs also operate as a contract between the parties. The Register of ILUAs is kept by the Native Title Registrar in accordance with s199A of the NTA and includes a description of the ILUA area, the parties' names, the term of the ILUA and other information as the Registrar considers is appropriate (s199B of the *Native Title Act 1993* (NTA)).

Registration confers a contractual effect on the ILUA and binds all persons holding native title regardless as to whether they are already parties to the ILUA (s24EA of the NTA).

Data from the National Native Title Tribunal identified no Native Title determinations or ILUAs within the OAs. The EMBA overlaps six Native Title determinations, outlined below and shown in Figure 3-20. Table 4-6 lists the relevant persons consulted where areas intersect or have close proximity to the EMBA:

- Bindunbur determination area, located ~320 km north-east of the closest OA. The representative organisation for the determined area is Gogolanyngor Aboriginal Corporation;
- Ngarla and Ngarla #2 determination area, located ~45 km south of the closest OA. The representative organisation for the determined area is Wanparta Aboriginal Corporation. The Kimberley Land Council is the Native Title Representative Body for the region;
- Kariyarra determination area, located ~65 km south of the closest OA. The representative organisation for the determined area is Kariyarra Aboriginal Corporation;
- Ngarluma/Yindjibarndi determination area, located ~145 km south-west of the closest OA. The representative organisation for the determination area is Ngarluma Aboriginal Corporation.;
- Yaburara & Mardudhunera determination area, located ~500 km south-west of the closest OA. The representative organisation for this determination area is Wirrawandi Aboriginal Corporation; and
- Gnulli, Gnulli #2 and Gnulli #3 – Yinggarda, Baiyungu and Thalanyji People determination area, located ~190 km south-west of the closest OA. The representative organisation for this determination area is Nganhurra Thanardi Garrbu Aboriginal Corporation.
- Northern Land Council determination area in waters known as Ashmore and Cartier Islands Territory located on the outer edge of the continental shelf in the Indian Ocean, ~320 km off Australia's north-west coast and 144 km south of the Indonesian island of Roti. A small section of the determination area intersects the EMBA.

The EMBA overlaps two pending and registered Native Title claim areas (NTCA):

- Thalanyji/Nhuwala People; and
- Nhuwala Claim Group.

The EMBA overlaps four ILUAs (Figure 3-20), outlined below:

- Nganhurra Thanardi Garrbu Aboriginal Corporation Conservation Estate ILUA, located ~470 km south-west of the closest OA;
- KM & YM ILUA 2018, located ~190 km south-west of the closest OA;
- Cape Preston Project Deed (YM Mardie ILUA), located ~255 km south-west of the closest OA;
- Alinta-Kariyarra Electricity Infrastructure ILUA, located ~65 km south of the closest OA.

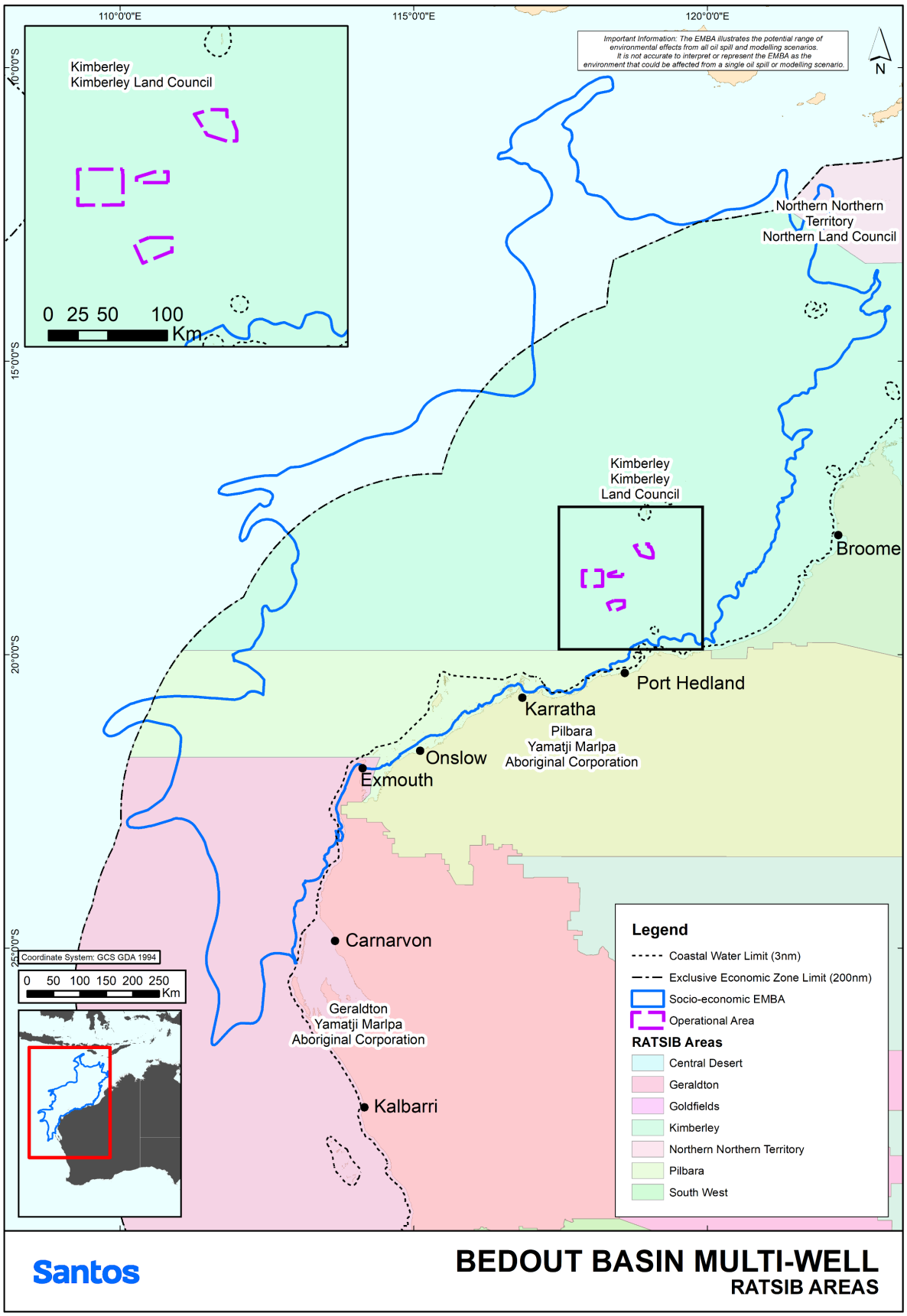



**Figure 3-19: RATSIB areas in the vicinity of the OAs and environment that may be affected**

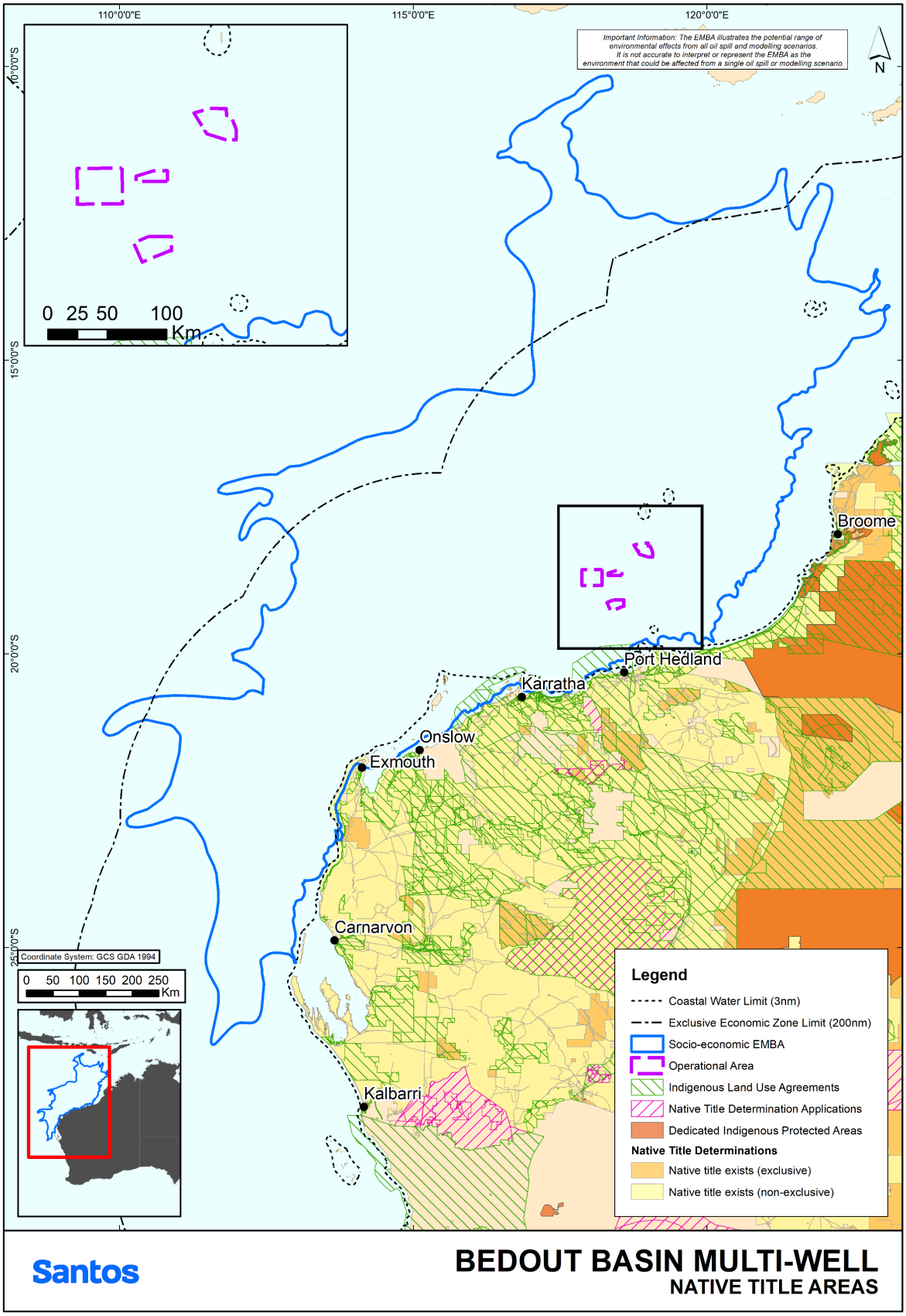



**Figure 3-20: Native Title determinations, ILUA and IPAs in the vicinity of the OAs and environment that may be affected**

#### *3.2.7.1.4 Indigenous Protected Area*

Indigenous Protected Areas (IPAs) are areas of land and sea that First Nations people have agreed to manage for biodiversity conservation. IPAs represent >50% of the National Reserve System.

The Sea Country Indigenous Protected Areas (IPA) Program seeks to increase the area of sea in IPAs to strengthen the conservation and protection of Australia's unique marine and coastal environments, while creating employment and economic opportunities for Indigenous Australians.

A search of DCCEEW and National Native Title Tribunal (NNTT) data identified no IPAs within the OAs or EMBA. The closest IPA is Nyangumarta Warrarn, located ~110 km south-east of the closest OA (Mestrel/Bancroft).

#### *3.2.7.1.5 Aboriginal Cultural Heritage Inquiry System*

The Department of Planning, Lands and Heritage (DPLH) Aboriginal Cultural Heritage Inquiry System (ACHIS) provides information about Aboriginal sites (as defined under the *Aboriginal Heritage Act 1972* (WA)) in Western Australia. To identify Aboriginal sites that may be affected by the activities, a search of the ACHIS was undertaken September 2024, which indicated (DPLH, 2024):

- no registered or lodged Aboriginal sites were identified within the OA
- the EMBA overlaps with 209 registered heritage sites
- the EMBA overlaps with 66 lodged heritage sites.

Given the environmental conditions of the Bedout Basin, characterised by deep water, high-energy marine dynamics, and frequent cyclonic activity, the likelihood of preservation of archaeological material is considered extremely low (Ellengowan Enterprises, 2025). Based on the figures provided with the search output, all of these are at least 45 km from the OAs and most appear to be located on islands or on the mainland. None of these Aboriginal sites will be disturbed by planned activities. In the unlikely event of a LOWC release, which is assessed as low risk (Refer Section 7.6.4), it is not anticipated that shoreline impact to cultural features would arise.

The results of the ACHIS search are appended at Appendix E.

### 3.2.7.2 Maritime Heritage

There are no listed or recorded shipwrecks within or in the vicinity of the OAs. The closest known shipwrecks to the OAs are the Pearl (lost at North Turtle Island) and the Lively (lost in 1806 at Mermaid Reef).

Shipwreck data from the Australian National Shipwrecks Database (which was removed in 2024 but remains accessible online) identified 202 shipwrecks located within the EMBA. Under the Commonwealth *Underwater Culture Heritage Act 2018* all shipwrecks older than 75 years are protected, while those dated pre-1900 are protected by WA law under the *Maritime Archaeology Act 1973*. Given the environmental conditions of the Bedout Basin, characterised by deep water, high-energy marine dynamics, and frequent cyclonic activity, the likelihood of preservation of archaeological material is considered extremely low (Ellengowan Enterprises, 2025).

### 3.2.7.3 Commercial Fisheries

Offshore and coastal waters in the North-West Marine Region support a valuable and diverse commercial fishing industry. The major fisheries in the Pilbara region target tropical finfish, large pelagic fish, crustaceans (prawns and scampi) and pearl oysters (Butler et al., 2024).

These North-West Marine region fisheries are managed by either the Department of Primary Industries and Regional Development (DPIRD) (State fisheries) with specific management plans, regulations, and a variety of subsidiary regulatory instruments under the *Fish Resources Management Act 1994*, or by the Australian Fisheries Management Authority (AFMA) which manages Commonwealth fisheries within the 200 nautical mile Australian Fishing Zone.

Commonwealth and State fisheries overlapping with the operational area and the EMBA are described in Table 3-12 and shown in Figure 3-21 to Figure 3-25. Fishing activity data was sourced from the Fish Cube database utilising the six 10 nm grid squares that overlapped and were adjacent to the OAs as well as datasets from the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) fishery status reports (ABARES, 2024).

Previous consultation with DPIRD has identified commercial fishing interests that exist in or in close proximity to the activities proposed under this EP. This consultation also identified key fish species that may be aggregating or spawning in the EMBA. This information is included in Table 3-12 where relevant.

No active commercial fishing effort was identified within or adjacent to the OAs for these Commonwealth fisheries. Six of the ten state managed fisheries were fisheries zones that spanned the whole of the WA state and while fishers could fish across the whole of the state, efforts are typically concentrated further south and no active fishing effort was identified. Of the remaining state fisheries only one, the Pilbara Fish Trawl (Interim) Managed Fishery, had recorded recent fishing efforts within and adjacent to the OAs (see Figure 3-25).

**Table 3-12: Commonwealth and state fisheries that overlap the OAs and environment that may be affected**

| Fishery | Fishery Licence Area Overlap | | | | | Description[1] | Fishing activity within operational areas |
|---|---|---|---|---|---|---|---|
| | Ara | Curie | Mestrel/ Bancroft | Wallace | EMBA | | |
| **Commonwealth Managed Fisheries** | | | | | | | |
| Western Tuna and Billfish Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | Extends west from Cape York Peninsula (Queensland) to 34° S off the Western Australian coast. The fishery also extends east across the Great Australian Bight to 141° E. Fishing effort concentrated off south-west Western Australia (WA).<br>Since 2005, fewer than five vessels have been active in the Western Tuna and Billfish Fishery each year, which has reportedly declined from 50 active vessels in 2000.<br>Fishing activity in the Western Tuna and Billfish Fishery concentrates in waters off south-west Western Australia, and off South Australia. | No active commercial fishing in or near the OAs from 2013–2023 |
| Southern Bluefin Tuna Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | Consists of all Australian waters to 200 nm from the coast. Fishing activity concentrated off south-east Australia and in the Great Australian Bight. | No active commercial fishing in or near the OAs from 2013–2023 |
| Western Skipjack Tuna Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | Separated into two sectors (east and west). Fishery is located in all Australian waters west of 142° 30′ 00°E, out to 200 nm from the coast. | No active commercial fishing in or near the OAs from 2013–2023 |
| North West Slope Trawl Fishery | ✗ | ✓ | ✗ | ✗ | ✓ | Fishery extends from 114° E to ~125° E off the WA coast between the 200 m isobath and the outer limit of the Australian Fishing Zone (AFZ). Demersal crustacean trawl occurs seaward of the 200 m isobath. | No active commercial fishing in or near the OAs from 2013–2023 |
| Western Deepwater Trawl Fishery | ✗ | ✗ | ✗ | ✗ | ✓ | Extends in the north from the boundary of the AFZ to 114° E, to the southern boundary of the AFZ to 115°08′ E. Fishing occurs from the 200 m isobath to the edge of the AFZ. | No active commercial fishing in or near the OAs from 2013–2023 |
| **State Managed Fisheries** | | | | | | | |
| Exmouth Gulf Prawn Managed Fishery | ✗ | ✗ | ✗ | ✗ | ✓ | This fishery operates in sheltered waters on the western half of the Exmouth Gulf. The Muiron Islands and Point Murat provide western boundary; Serrurier Island provides northern limit. | No active commercial fishing in or near the OAs from 2013–2023 |

[6] *All descriptions based on Newman et al. (2023) and Butler et al. (2024) unless otherwise cited*

| Fishery | Fishery Licence Area Overlap | | | | | Description[1] | Fishing activity within operational areas |
|---|---|---|---|---|---|---|---|
| | Ara | Curie | Mestrel/ Bancroft | Wallace | EMBA | | |
| Onslow Prawn Managed Fishery | ✗ | ✗ | ✗ | ✗ | ✓ | The boundaries of this fishery are 'all the WA waters between the Exmouth Prawn Fishery and the Nickol Bay Prawn Fishery east of 114°39.9' on the landward side of the 200 m depth isobath'.<br>Prawn trawling activities focus on inshore areas between Onslow and Karratha. | No active commercial fishing in or near the OAs from 2013–2023 |
| Pilbara Demersal Scalefish Fisheries (includes trawl, trap and line fisheries) | ✓ | ✓ | ✓ | ✓ | ✓ | Comprises:<br>• Pilbara Fish Trawl (Interim) Managed Fishery occupying the waters north of latitude 21°35′S and between longitudes 114°9′36″E and 120°E. Seaward of the 50 m isobath and landward of the 200 m isobath, consists of two zones;<br>• Pilbara Trap Managed Fishery, permitted to operate between 21°56´ S latitude and the high water mark on the western side of the North West Cape; and<br>• Pilbara Line Fishery, limited within Pilbara waters from 21° 56′ S to 120 E. | FishCube identified some active fishing effort for the Pilbara Fish Trawl (Interim) Managed Fishery within the Curie and Mestrel/Bancroft OAs between 2013 and 2023 (see Figure 3-25).<br>Catch is predominately within Mestrel/Bancroft OA with total catch ranging from 35,000–115,000 kg, up to 200,000–400,000 kg per 10 NM block for the 10-year period 2013–2023. The maximum recorded catch within the Mestrel/Bancroft OA during 2017–2018 (52,668 kg). |
| | | | | | | | No active commercial fishing in or near the OAs from 2013–2023 |
| | | | | | | | No active commercial fishing in or near the OAs from 2013–2023 |
| Pilbara Developmental Crab Managed Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | Concentrated in coastal embayment's and estuaries between Geographe Bay and Nickol Bay. Fishing in the Pilbara coast primarily occurs from Onslow to Port Hedland in inshore waters. | No active commercial fishing in or near the OAs from 2013–2023 |
| Sea Cucumber Fishery | ✗ | ✗ | ✗ | ✗ | ✓ | Sea cucumber fishery activities is permitted within Western Australian waters outside of marine parks. Fishing methods involve hand collection via wading or diving. | No active commercial fishing in or near the OAs from 2013–2023 |
| Nickol Bay Prawn Managed Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | Extends northward from the Exmouth Prawn Fishery and east to the 200 m isobath at 114° 39.9′. | No active commercial fishing in or near the OAs from 2013–2023 |
| Pearl Oyster Managed Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | The fishery is located in shallow coastal waters along the North West Shelf where fishing effort is via drift diving. | No active commercial fishing in or near the OAs from 2013–2023 |
| Shark Bay Crab Managed Fishery | ✗ | ✗ | ✗ | ✗ | ✓ | Located within the waters of Shark Bay extending from Dirk Hartog Island to Steep Point on the mainland. | No active commercial fishing in or near the OAs from 2013–2023 |

| Fishery | Fishery Licence Area Overlap | | | | | Description[1] | Fishing activity within operational areas |
|---|---|---|---|---|---|---|---|
| | Ara | Curie | Mestrel/ Bancroft | Wallace | EMBA | | |
| Shark Bay Prawn Managed Fishery | ✗ | ✗ | ✗ | ✗ | ✓ | Located within the waters of Shark Bay extending from south of Denham to north of Koks Island and Carnarvon. | No active commercial fishing in or near the OAs from 2013–2023 |
| Shark Bay Scallop Managed Fishery | ✗ | ✗ | ✗ | ✗ | ✓ | Located within the waters of Shark Bay extending between 23°34′ S 26°30′ S to the 200 m isobath. | No active commercial fishing in or near the OAs from 2013–2023 |
| West Coast Rock Lobster Managed Fishery | ✗ | ✗ | ✗ | ✗ | ✓ | This fishery targets the western rock lobster between Shark Bay and Cape Leeuwin. Baited traps (pots) and with a commercial and recreational fishing season. | No active commercial fishing in or near the OAs from 2013–2023 |
| Gascoyne Demersal Scalefish Managed Fishery | ✗ | ✗ | ✗ | ✗ | ✓ | The fishery operates between latitudes 23°07′30″S and 26°30′S in the waters of the Indian Ocean and Shark Bay. Vessels not permitted to fish in inner Shark Bay. Merchandised handlines. | No active commercial fishing in or near the OAs from 2013–2023 |
| **State Managed Fisheries (whole of the state)** | | | | | | | |
| Mackerel Managed Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | Trolling or handline. Near-surface trolling gear from vessels in coastal areas around reefs, shoals, and headlands. | FishCube identified very low fishing effort for the Mackerel Managed Fishery within the Mestrel/Bancroft OA between 2013 and 2023:<br><1,000 kg catch with a vessel count <3 between 2014 and 2015 in the Mestrel/Bancroft OA |
| Marine Aquarium Fish Managed Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | Operates in Western Australian state waters. Restricted by diving depths. Commercial operators are permitted to take over 250 species of finfish as well as coral, live rock, algae, seagrass, and invertebrates. | No active commercial fishing in or near the operational area from 2013–2023 |
| Specimen Shell Managed Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | Dive based fishery, operates all year through Western Australian waters between the high-water mark and the 200 m isobath'. Hand harvest method used; an exemption method being employed is using a remote-controlled underwater vehicle between depths of 60–300 m. | No active commercial fishing in or near the operational area from 2013–2023 |
| West Coast Deep Sea Crustacean Managed Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | This fishery operates north of latitude 34° 24' S (Cape Leeuwin) and west of the Northern Territory border on the seaward side of the 150 m isobath out to the extent of the AFZ, mostly in 500–800 m of water. Baited pots operate in a longline formation in the shelf edge waters (>150 m). | No active commercial fishing in or near the operational area from 2013–2023 |

| Fishery | Fishery Licence Area Overlap | | | | | Description[1] | Fishing activity within operational areas |
|---|---|---|---|---|---|---|---|
| | Ara | Curie | Mestrel/ Bancroft | Wallace | EMBA | | |
| Abalone Managed Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | Shallow coastal waters off the coast of Western Australia. Divided into eight management areas, commercial fishing for greenlip/brownlip abalone is managed in three sectors. | No active commercial fishing in or near the operational area from 2013–2023 |
| South-West Coast Salmon Fishery | ✓ | ✓ | ✓ | ✓ | ✓ | There are currently six licences. Licensees are not restricted to specific beaches but in practice only a few beaches are fished. In 2018 there were three active vessels in this fishery. | No active commercial fishing in or near the operational area from 2013–2023 |

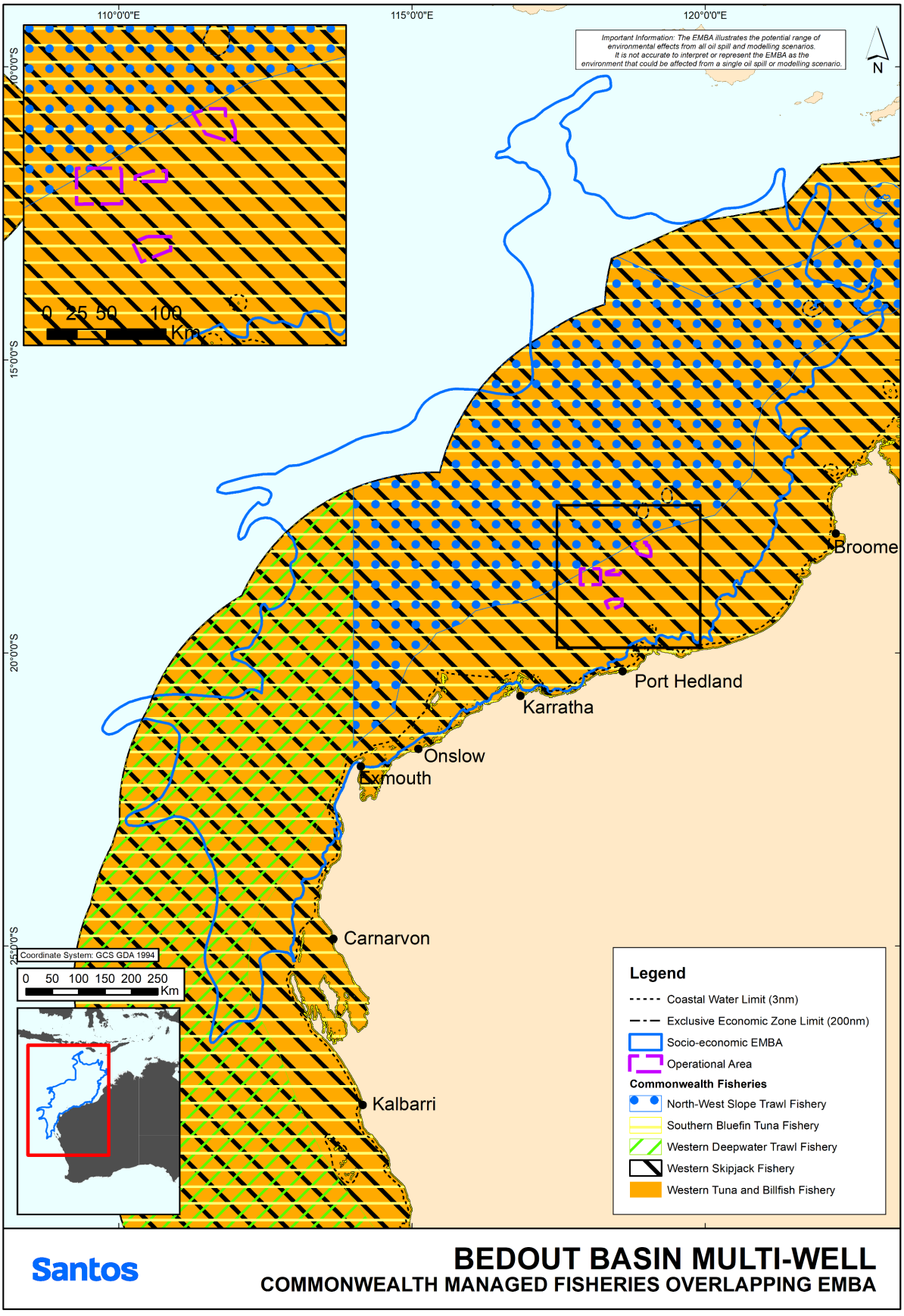



**Figure 3-21: Commonwealth-managed fisheries in relation to the EMBA and operational areas**

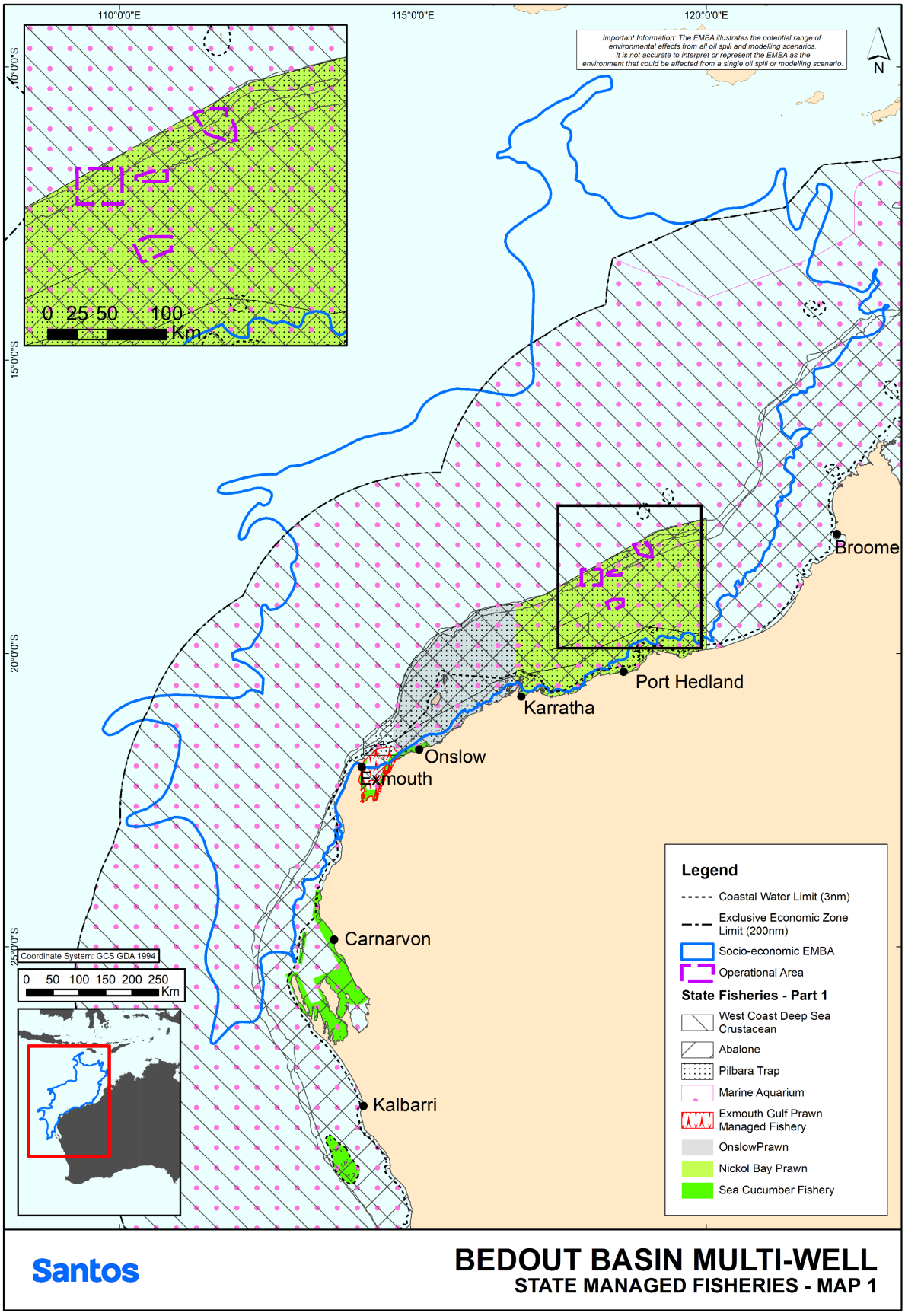



**Figure 3-22: State-managed fisheries in relation to the EMBA and operational areas (Figure 1 of 3)**

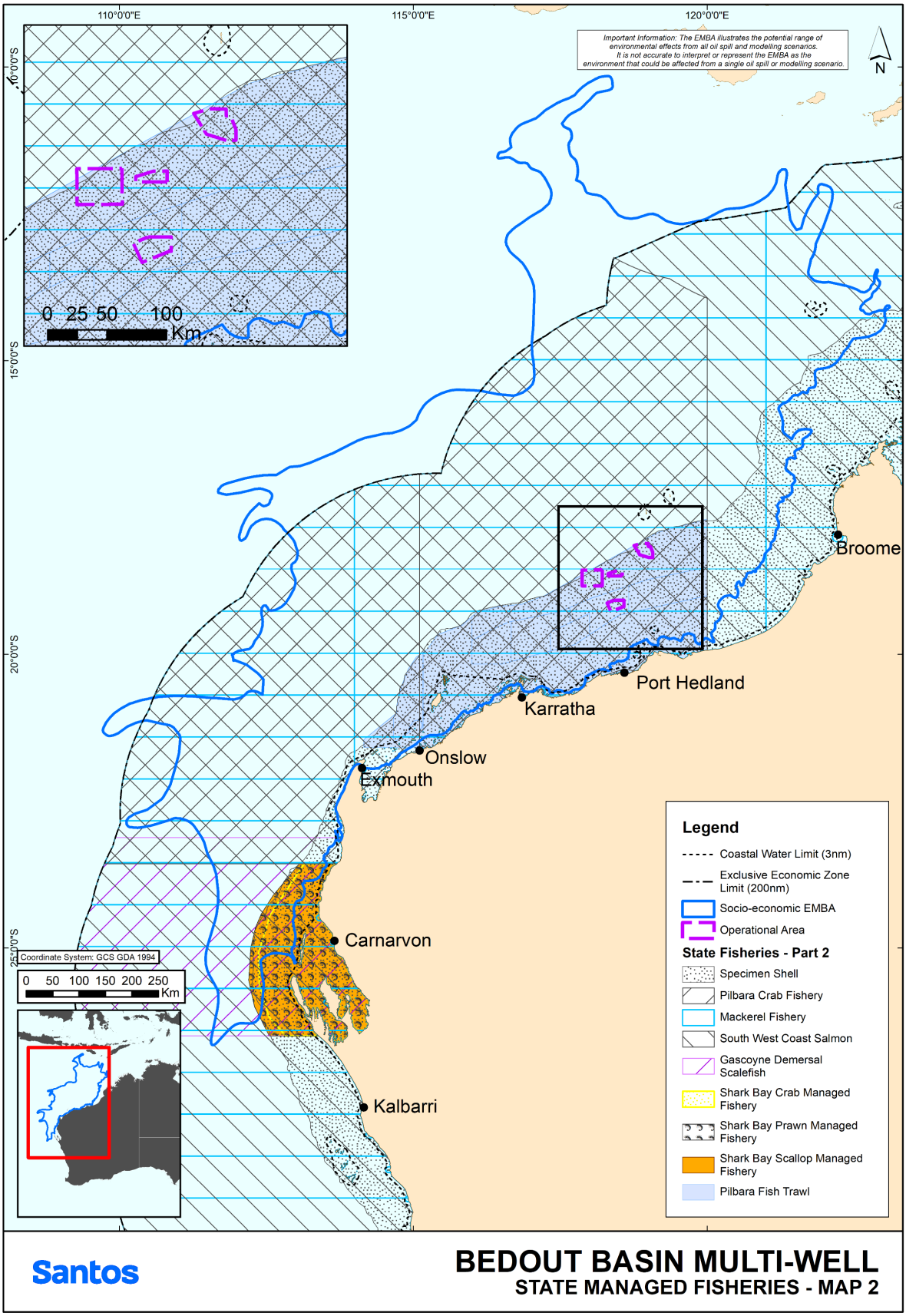



**Figure 3-23: State-managed fisheries in relation to the EMBA and operational areas (Figure 2 of 3)**

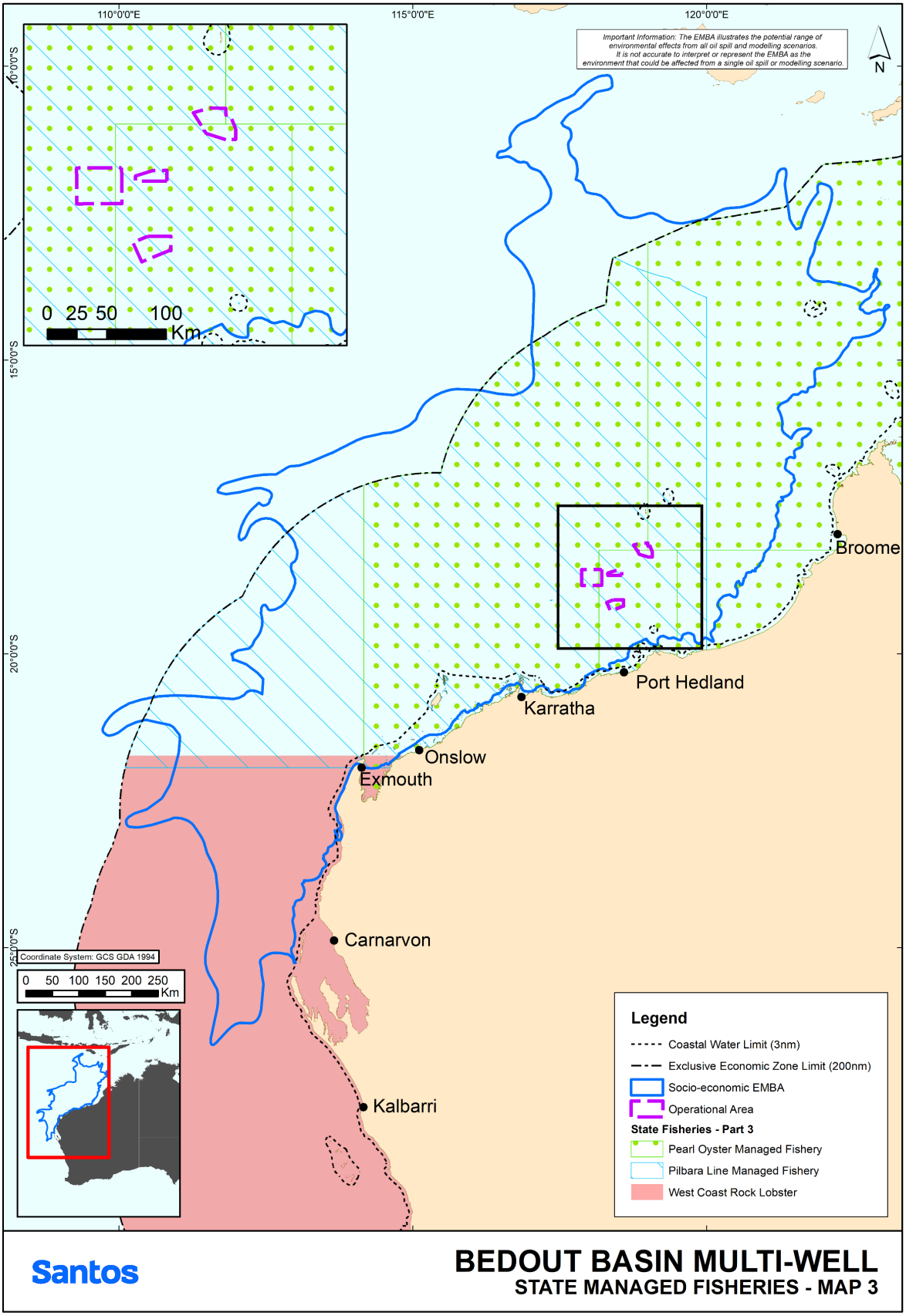



**Figure 3-24: State-managed fisheries in relation to the EMBA and operational areas (Figure 3 of 3)**

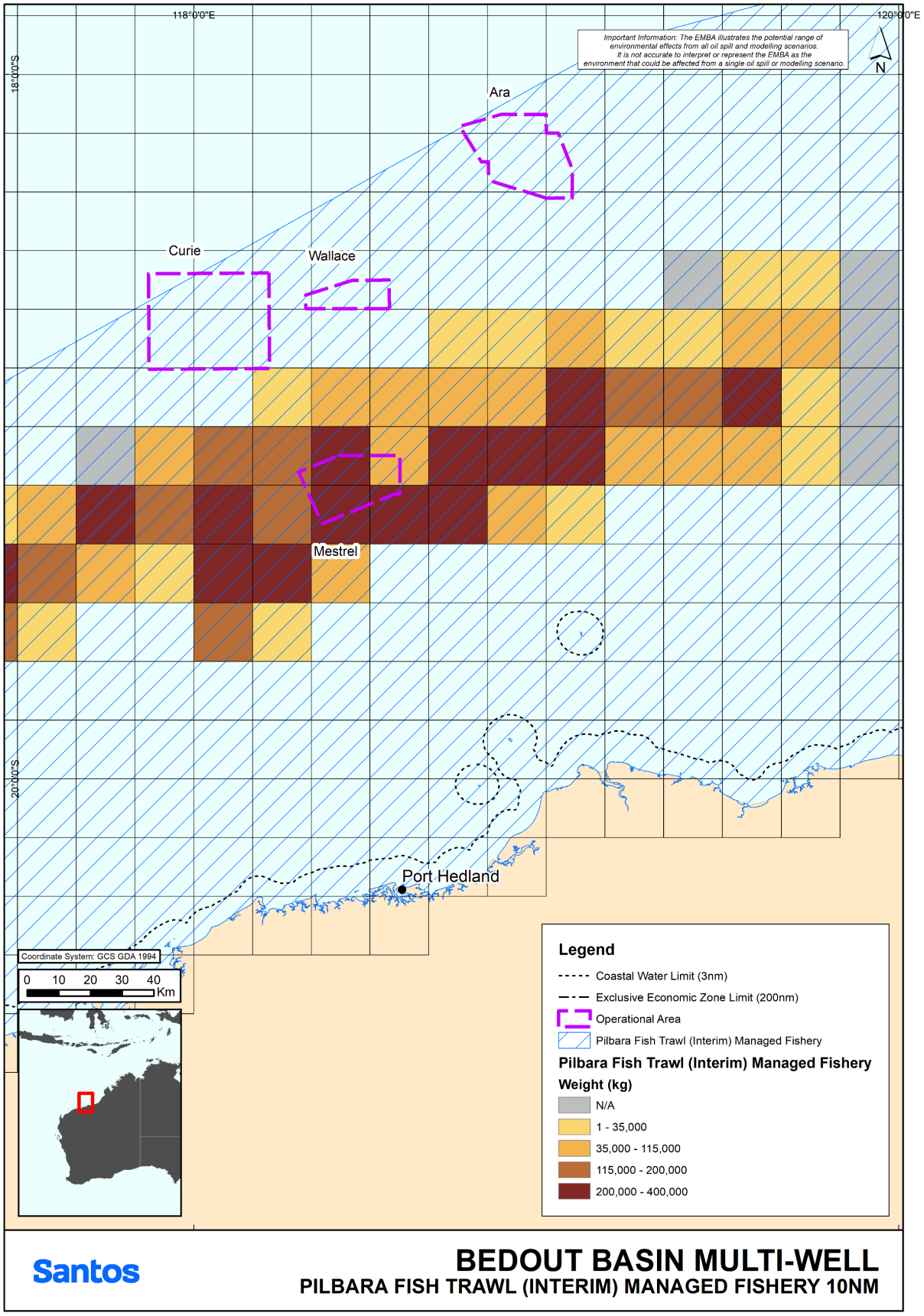



**Figure 3-25: Pilbara fish trawl managed fishery catch effort (2013–2023)**

### 3.2.7.4 Recreational Fisheries

Given the depth of the OAs (ranging from ~80–265 m) and its distance from land (ranging from ~123–225 km from Port Hedland), it is unlikely recreational fishing will occur.

Recreational fishing activities often occur around the Port Hedland port marker buoys. Consultation with the Port Hedland Game Fishing Club and Port Hedland Volunteer Marine Rescue for the Dorado development project (Santos, 2021) identified that recreational fishing activity may occur 50 nm offshore, with some locals targeting game fish up to the 50 m water depth and the area surrounding Bedout Island. The EMBA also includes a number of other recreational fishing sites including Glomar Shoals, the Ningaloo coast and Rowley Shoals.

#### 3.2.7.5 Tourism and Recreation

Given the water depths of the OAs (ranging from ~80–265 m) and the lack of notable seabed features, there are no known tourism-based activities in the surrounding waters of the OAs. The nearest area where recreation (diving) is likely to occur is Bedout island, which is located ~65 km from the Mestrel/Bancroft OA, and the Argo-Rowley Terrace AMP (~40 km from Ara OA).

Popular water-based activities that may occur in the EMBA include fishing, swimming, snorkelling, diving, surfing, windsurfing, kiting and boating. Within the EMBA these activities are concentrated in the vicinity of the population centres such as Exmouth, Dampier and Port Hedland. Seasonal nature-based tourism, such as humpback whale watching, whale shark encounters and tours of turtle hatching, mainly occurs around Ningaloo Reef and Cape Range National Park.

#### 3.2.7.6 Oil and Gas Industry

The broader area of the NWS is a major oil and gas hub in Australia, with several companies operating on the Shelf. The Activity occurs in a particularly isolated area of the NWS with respect to the main oil and gas operational and exploratory fields, with no existing operating facilities within proximity to the OAs

#### 3.2.7.7 Commercial Shipping

Commercial shipping in the immediate vicinity of the OAs is primarily iron ore carriers, oil tankers and other vessels proceeding to or from Port Hedland. Figure 3-26 shows shipping fairways and vessel movements near the OAs (AMSA 2025). The location of the OAs in respect of the nearest shipping fairways are presented in Table 3-13. Two OAs (Curie and Mestrel/Bancroft) overlap shipping fairways

**Table 3-13: Nearest shipping fairways to the OAs**

| Operational area | Distance and direction from nearest shipping fairway | Vessels per day |
|---|---|---|
| Curie | Overlap | 9–22 |
| Wallace | Adjacent 494 m | 0–1 |
| Mestrel/Bancroft | Overlap | 0–2 |
| Ara | 10 km W | 0–1 |

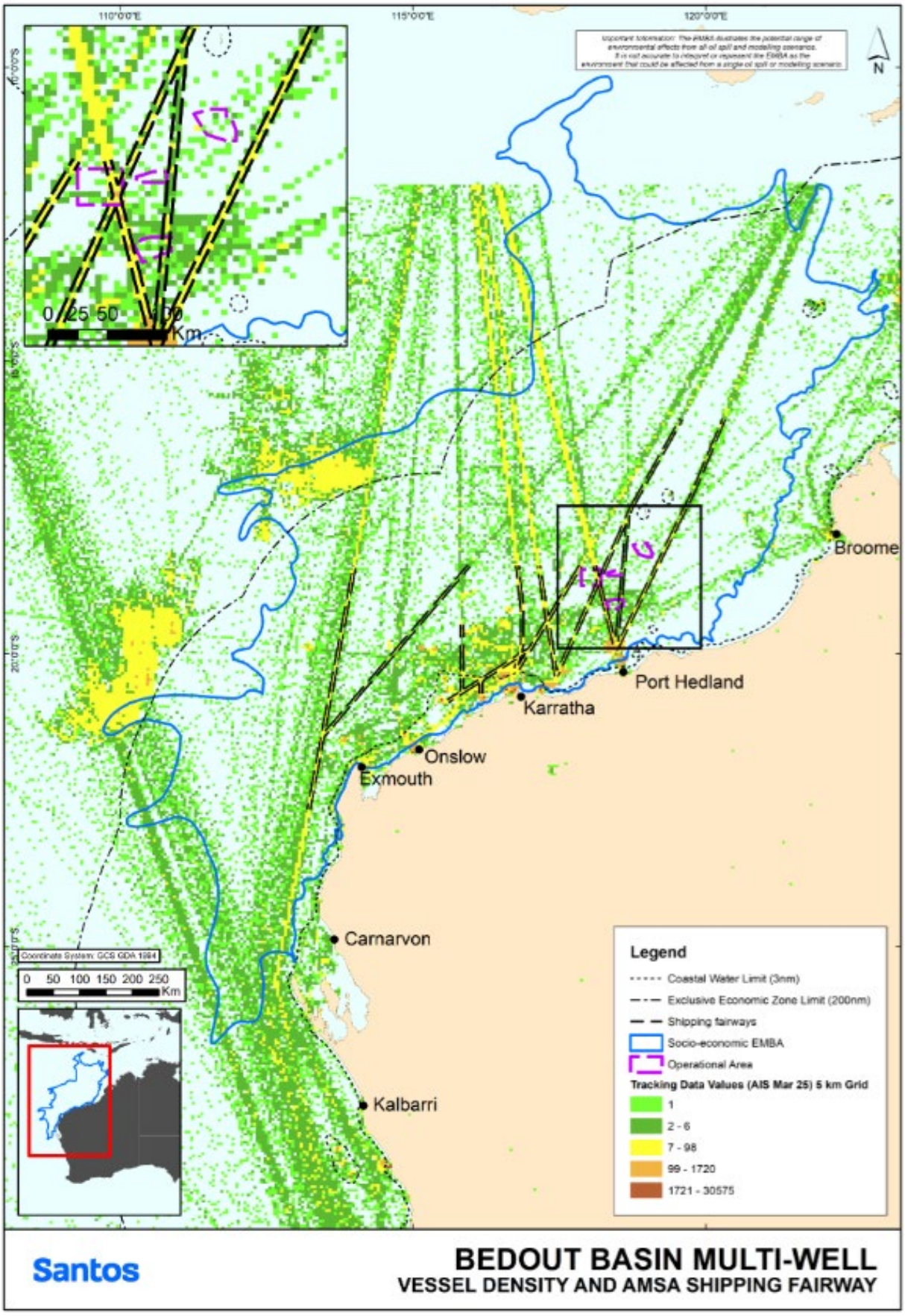



**Figure 3-26: Commercial shipping and AMSA fairways in relation to the EMBA and operational areas**

#### 3.2.7.8 Defence

A Defence Training Area (RAAF Base Learmonth) overlaps the EMBA and is in excess of 350 km from the nearest OA, as shown in Figure 3-27. Defence areas within the region are described in Appendix C.

#### 3.2.7.9 Telecommunications Cables

The JASURAUS submarine communication cable links Australia with Indonesia. The cable was installed as a link from Australia to provide telephone services connection to the world in 1995-1996. Travelling north out of Port Hedland for ~210 km the cable then heads north-west toward Jakarta, Indonesia. The cable runs up through Permit Area WA-435-P. Its capacity and major role was overtaken in 2000 by other subsea cables out of Australia. However, Telstra continues to manage the cable as it remains an emergency backup link out of Australia. The cable includes two submerged repeaters in the wider region.

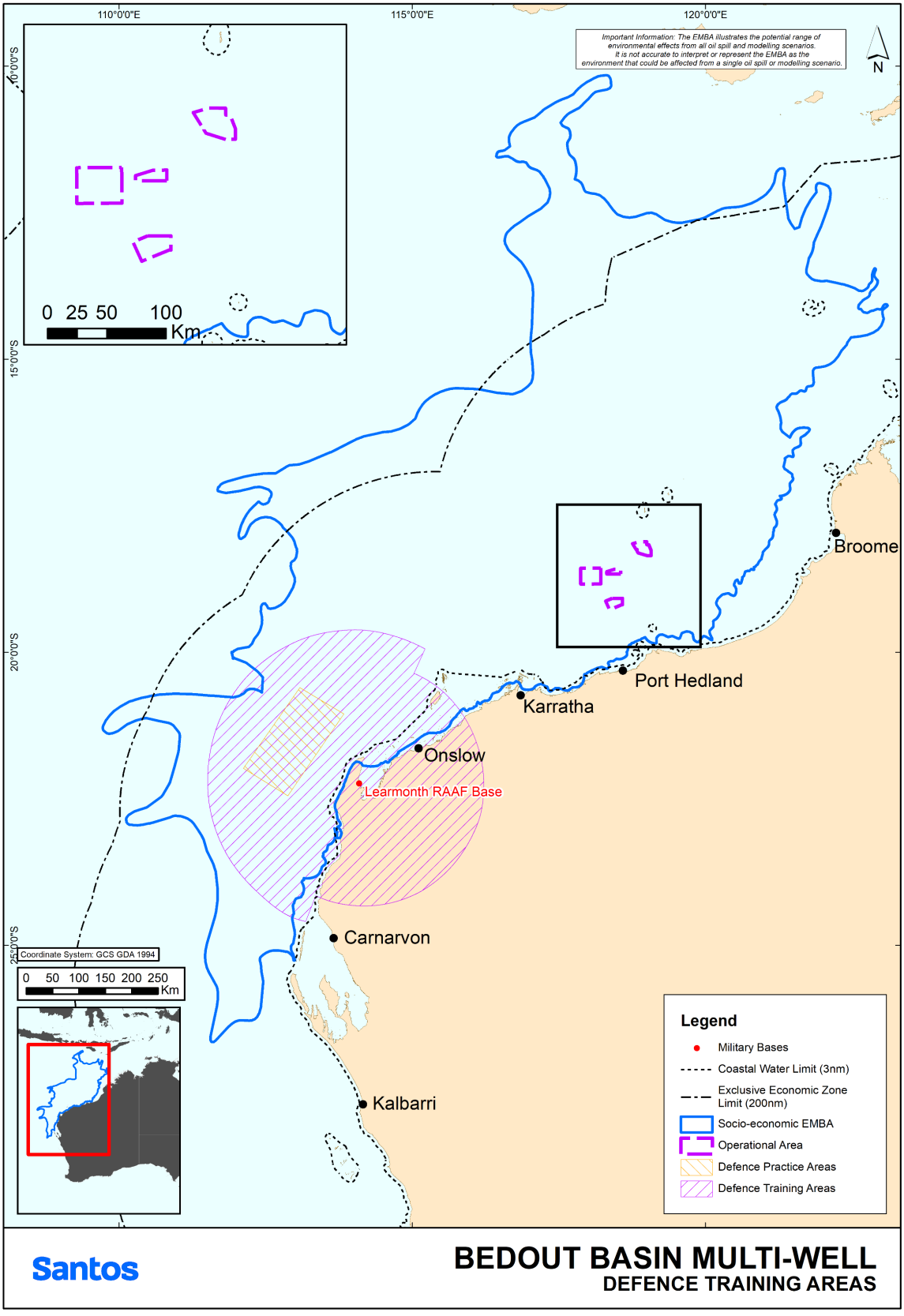



**Figure 3-27: Defence training areas in relation to the EMBA and operational area**

### 3.2.8 Windows of Sensitivity

Timing of peak sensitivity or activity for values and sensitivities relevant to this EP are summarised in Table 3-14.

**Table 3-14: Windows of sensitivity in the vicinity of the OAs and environment that may be affected**

| Categories | Receptors (critical life cycle stages) | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Physical environment and habitats | Non-coral benthic invertebrates | | | | | | | | | | | | |
| | Coral (spawning periods) | | | | | | | | | | | | |
| | Macroalgae | Growing | | | | Shedding fronds | | | | Growing | | | |
| | Other benthic habitats | | | | | | | | | | | | |
| Marine Fauna (incl. threatened/ migratory species) | **Fish/ Sharks and fisheries species** | | | | | | | | | | | | |
| | Whale sharks | | | Aggregations at Ningaloo Coast | | | | | | | | | |
| | Fisheries species spawning/aggregation times [1] | | | | | | | | | | | | |
| | Baldchin groper | | | | | | | | | | | | |
| | Blacktip shark | | | | | | | | | | | | |
| | Crystal crab | | | | | | | | | | | | |
| | Goldband snapper | | | | | | | | | | | | |
| | King george whiting | | | | | | | | | | | | |
| | Pink snapper | | | | | | | | | | | | |
| | Rankin cod | | | | | | | | | | | | |
| | Red emperor | | | | | | | | | | | | |
| | Spangled emperor | | | | | | | | | | | | |
| | Sandbar shark | | | | | | | | | | | | |
| | Spanish mackerel | | | | | | | | | | | | |
| | **Marine Mammals** | | | | | | | | | | | | |
| | Dugong (breeding) | Breeding | | | | | | | | Breeding | | | |
| | Australian sea lion (breeding) | Breeding and caring for young | | | | | | | | | | | |
| | Humpback whale (migration) | | | | | | Northern | | | Southern | | | |
| | Sei whale (migration) | | | | | Low density, same general pattern of migration as most other baleen whales | | | | | | | |

| Categories | Receptors (critical life cycle stages) | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Southern right whale (migration) | | | | | Northern | | | | Southern | | | |
| | Blue whale (migration) | | | | | Northern | | | | | | Southern | |
| | **Marine Reptiles** | | | | | | | | | | | | |
| | Hawksbill turtle's resident adult and juveniles[2] | Widespread throughout NW Shelf waters, highest density of adults and juveniles over hard bottom habitat (coral reef, rocky reef, pipelines etc.) | | | | | | | | | | | |
| | Hawksbill turtle (mating aggregations[2]) | | | | | | | | | | | | |
| | Hawksbill turtle (nesting and internesting[2]) | | | | | | | | | | | | |
| | Hawksbill turtle (hatching[1]) | | | | | | | | | | | | |
| | Flatback turtles (resident adult and juveniles[2]) | Widespread throughout NW Shelf waters, increased density over soft bottom habitat 10–60 m deep, post hatchling age classes and juveniles spread across shelf waters | | | | | | | | | | | |
| | Flatback turtle (mating aggregations[2]) | | | | | | | | | | | | |
| | Flatback turtle (nesting and internesting[2]) | | | | | | | | | | | | |
| | Flatback turtle (hatching[2]) | | | | | | | | | | | | |
| | Flatback turtle (nesting[2]) | | | | | | | | | | | | |
| | Green turtles (resident adult and juveniles[2]) | Widespread throughout the NW Shelf waters, highest density associated with seagrass beds and macro algae communities, high density juveniles in shallow waters off beaches, amongst mangroves and in creeks | | | | | | | | | | | |
| | Green turtle (mating aggregations[2]) | | | | | | | | | | | | |
| | Green turtle nesting and internesting[2]) | | | | | | | | | | | | |
| | Green turtle (hatching[2]) | | | | | | | | | | | | |
| | Loggerhead turtles (resident adult and juveniles[2]) | Widespread throughout the NW Shelf waters, increased density associated with soft bottom habitat supporting their bivalve food source, juveniles associated with nearshore reef habitat | | | | | | | | | | | |

| Categories | Receptors (critical life cycle stages) | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Loggerhead turtle (mating aggregations[2]) | | | | | | | | | | | | |
| | Loggerhead turtle (nesting and internesting[2]) | | | | | | | | | | | | |
| | Loggerhead turtle (hatching[2]) | | | | | | | | | | | | |
| | Olive Ridley turtle (nesting) | Can occur at low density across the NWS year-round | | | | | | | | | | | |
| | Leatherback turtles | Can occur at low density across the NWS year-round | | | | | | | | | | | |
| | Short-nosed Sea snake | Can occur at low density across the NWS year-round | | | | | | | | | | | |
| | **Seabirds** | | | | | | | | | | | | |
| | Terns, shearwaters, petrels (nesting) | | | | | | | | | | | | |
| | **Commercial Managed Fisheries** | | | | | | | | | | | | |
| | **Oil and gas** | | | | | | | | | | | | |
| | **Shipping** | | | | | | | | | | | | |
| | **Tourism/ recreational** | None applicable | | | | | | | | | | | |

| Key / Notes | | |
|---|---|---|
| | Peak activity, presence reliable and predictable | [1] Information provided from Department of Fisheries consultation |
| | Lower level of abundance/activity/presence | [2] Information provided by K. Pendoley |
| | Very low activity/ presence | |
| | Activity can occur throughout year | |
| | Proposed timing of activity | |

# 4. Stakeholder Consultation

## 4.1 Consultation summary

Santos has undertaken consultation with each relevant person (agency, authority, organisation or person as described in section 25(1) of the OPGGS(E)R) for this EP in accordance with OPGGS(E)R consultation requirements, applicable case law and applicable guidance (e.g. NOPSEMA guidance issued in May 2024[7]).

Consultation with relevant persons regarding the proposed activity generally commenced in July 2025 with a minimum consultation period of 30 days being offered, building on Santos' history of consultation in the region for exploration activities including drilling and seismic surveys.

This historical consultation includes:

- Bedout Multi-Well Drilling Environment Plan, which was accepted in 2021 and two exploration wells (Pavo-1 and Apus-1) drilled in 2022
- Keraudren Extension 3D Marine Seismic Survey Environment Plan, which was accepted in 2020 with activities undertaken in June–July 2021.
- Keraudren Seismic Survey Environment Plan, which was accepted in 2019 with activities undertaken May–July 2019.

Santos considers there has been an appropriate level of consultation with relevant persons for this EP, including by way of providing each with sufficient information to allow them to make an informed assessment of the potential consequences of the proposed appraisal drilling activities on their functions, interests and activities and by allowing a reasonable period for the consultation.

- **Sufficient information** – for this EP, Santos provided information in different formats and with differing levels of detail including emails; a general fact sheet; a commercial fisher fact sheet; online and print advertisements; radio advertisements; social media posts; phone calls; in-person/online consultation meetings using dedicated presentation materials; and provision of information on the Santos Consultation Hub website. At a minimum all relevant persons, authorities and organisations were provided a consultation email and a general fact sheet, with the general fact sheet made available at in-person meetings.
- **Reasonable period of time** – for this EP, Santos provided a minimum 30 days from the date of providing consultation information for review and response by relevant persons identified for consultation. Santos sought to accommodate reasonable requests for additional time and considered input from relevant persons outside of the consultation period.
- **Publishing of information** – for this EP, Santos provided statements in its consultation materials and discussed at consultation sessions that relevant persons could request that information they provide not be published and that, if so requested, Santos would ensure that information is included in a separate report which is not published on NOPSEMA's website. In support, consultation emails and materials included a reference to the NOPSEMA '*Consultation on offshore environment plans'* (2023) brochure. Hard copies were also provided at in-person meetings.

A report detailing all consultations with relevant persons, as required by section 24(b) of the OPGGS(E)R, is included at Appendix F. That report includes, among the other content required by the regulations, an assessment of the merits of any objections or claims raised about adverse impacts of the proposed appraisal drilling activities.

In accordance with section 22(15) of the OPGGS(E)R, the implementation strategy in Section 8 provides for appropriate consultation with relevant government authorities and other relevant interested persons or organisations over the life of the Activity, including the provision of Activity notifications requested during consultation or where Santos has standing arrangements. Activity notifications, if required, are included in Table 8-4 and Table 8-6

During the public comment period, certain Relevant Persons made submissions. Santos determined that there were no new concerns raised by those Relevant Persons that had not already considered in the course of preparing this EP. Further, there were no potential new Relevant Persons which were identified for consultation through the public comment process. As such, Santos considers consultation in accordance with section 25 of the OPGGS(E) R to be complete.

[7] *Consultation in the course of preparing an environment plan, May 2024*

Consultation in preparing this EP has been completed and Santos believes it has met the applicable regulatory requirements in respect of consultation.

## 4.2 Regulatory requirements

Table 4-1 Outlines the applicable regulatory requirements for consultation with authorities, persons and organisations for this EP.

**Table 4-1: Consultation requirements under the OPGGS(E)R**

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 24. Other information in the environment plan** |
| The environment plan must contain the following:<br>b. a report on all consultations under section 25 of any relevant person by the titleholder, that contains:<br>i. a summary of each response made by a relevant person; and<br>ii. an assessment of the merits of any objection or claim about the adverse impact of each activity to which the environment plan relates; and<br>iii. a statement of the titleholder's response, or proposed response, if any, to each objection or claim; and<br>iv. a copy of the full text of any response by a relevant person. |
| **Section 25. Consultation with relevant authorities, persons and organisations, etc** |
| (1) In the course of preparing an environment plan (including a revised environment plan referred to in Division 5) a titleholder must consult each of the following (a ***relevant person***):<br>a. each Commonwealth, State or Northern Territory agency or authority to which the activities to be carried out under the environment plan may be relevant;<br>b. if the plan relates to activities in the offshore area of a State—the Department of the responsible State Minister;<br>c. if the plan relates to activities in the Principal Northern Territory offshore area—the Department of the responsible Northern Territory Minister;<br>d. a person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the environment plan;<br>e. any other person or organisation that the titleholder considers relevant.<br>(2) For the purpose of the consultation, the titleholder must give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on the functions, interests or activities of the relevant person.<br>(3) The titleholder must allow a relevant person a reasonable period for the consultation.<br>(4) The titleholder must tell each relevant person the titleholder consults that:<br>a. the relevant person may request that particular information the relevant person provides in the consultation not be published; and<br>b. information subject to such a request is not to be published under this Part. |
| **Section 26. Submission of environment plan** |
| *Form of environment plan*<br>(8) All sensitive information (if any) in an environment plan, and the full text of any response by a relevant person to consultation under section 25 in the course of preparation of the plan, must be contained in the sensitive information part of the plan and not anywhere else in the plan.<br>Note: Subparagraph 24(b)(iv) requires the plan to contain a copy of the full text of any response by a relevant person to consultation under section 25 in the course of preparation of the plan. |
| **Section 28. Publishing environment plan and associated information** |
| (1) If NOPSEMA's provisional decision under section 27 is that the environment plan includes material apparently addressing all the provisions of Division 2 (Contents of an environment plan), NOPSEMA must publish on NOPSEMA's website as soon as practicable:<br>a. the plan with the sensitive information part removed; and<br>b. the name of the titleholder who submitted the plan; and<br>c. a description of the activity or stage of the activity to which the plan relates; and<br>d. the location of the activity; and<br>e. a link or other reference to the place where the accepted offshore project proposal (if any) is published; and<br>f. details of the titleholder's nominated liaison person for the activity. |

## 4.3 Government and industry guidance

Santos has considered the following NOPSEMA guidance in developing its consultation activities and approach:

- GL2086 – *Consultation in the course of preparing an environment plan* (EP Consultation Guideline) (NOPSEMA, 2023; 2024a)
- GL1887 – *Consultation with Commonwealth agencies with responsibilities in the marine area* (NOPSEMA, 2024b)
- GL1721 – *Environment plan decision making* (NOPSEMA, 2024c)
- GN1344 – *Environment plan content requirement* – Guidance Note (NOPSEMA, 2025d)
- GN1488 – *Oil Pollution Risk Management* (NOPSEMA, 2025b)
- FM2281 – *Titleholder report on consultation in the preparation of an Environment Plan* (NOPSEMA, 2025c)
- *Petroleum activities and Australian Marine Parks: A guidance note to support environmental protection and effective consultation* (Australian Government, 2024). Jointly released by NOPSEMA and Parks Australia.

Santos has also considered other government and industry guidance, including:

- International Standards Organisation
  - ISO14001:2015 Environmental Management Systems
- Australian Fisheries Management Authority
  - Petroleum industry consultation with the commercial fishing industry
- Australian Heritage Commission
  - Ask First – A guide to respecting Indigenous heritage places and values
- Commonwealth Department of Agriculture, Fisheries and Forestry
  - Fisheries and the Environment – Offshore Petroleum and Greenhouse Gas Act 2006
  - Offshore Installations Biosecurity Guide
- Commonwealth Department of Climate Change, Energy, the Environment and Water
  - Interim Engaging with First Nations People and Communities on Assessments and Approvals under the *Environment Protection and Biodiversity Conservation Act 1999*
- Commonwealth Ministerial Council on Mineral and Petroleum Resources
  - Principles for Engagement with Communities and Stakeholders
- International Association for Public Participation
  - Quality Assurance Standard for Community and Stakeholder Engagement
- WA Department of Primary Industries and Regional Development
  - Guidance statement for oil and gas industry consultation with the Department of Fisheries
- WA Department of Transport and Major Infrastructure
  - Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements
  - WA Incident Management Plan: Marine Oil Pollution, September 2023
- Western Australian Fishing Industry Council
  - Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector
  - Consultation approach for unplanned events.

## 4.4 Case Law and Guidance

In addition to considering the regulatory requirements and guidance set out in Sections 4.2 and 4.3; in conducting consultation for the activities covered by this EP, Santos has considered the following judgements, regarding environment plans prepared under the OPGGS(E)R (or its predecessor):

- *Tipakalippa v National Offshore Petroleum Safety and Environmental Management Authority* (No. 2) [2022] FCA 1121
- *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 (Appeal Judgment)
- *Cooper v National Offshore Petroleum Safety and Environmental Management Authority (No 2)* [2023] FCA 1158.
- *Munkara v Santos NA Barossa Pty Ltd (No 3)* [2024] FCA 9

The EP Consultation Guideline (NOPSEMA, 2023; 2024a) provides a summary of the Full Federal Court's interpretation of 'functions', 'activities' and 'interests' referenced in section 25(1)(d) of the OPGGS(E)R, adopted by NOPSEMA to assist in informing who may be a Relevant Person and how Relevant Persons may be identified, as defined in Table 4-2.

**Table 4-2: Relevant Person terms and definitions**

| Term | Interpretation |
|---|---|
| Functions | Refers to 'a power or duty to do something' |
| Activities | To be read broadly and is broader than the definition of 'activity' in section 5 of the OPGGS(E)R and is likely directed to what the Relevant Person is already doing |
| Interests | To be construed as conforming with the accepted concept of 'interest' in other areas of public administrative law. Includes 'any interest possessed by an individual whether or not the interest amounts to a legal right or is a proprietary or financial interest or relates to reputation' |

Santos has also had regard to the purpose of consultation as outlined in the Appeal Judgment and EP Consultation Guideline (NOPSEMA, 2024a), the emphasis that superficial or tokenistic consultation is not sufficient and that:

- consultation must be appropriate and adapted to the nature of each Relevant Person;
- for each Relevant Person, the appropriate manner and method of consultation (including the nature of information, time periods for consultation and mode of communication) may differ; and
- there is good reason to adopt pragmatic and practical approaches to consultation conducted in accordance with section 25 of the OPGGS(E)R.

## 4.5 Santos' consultation methodology

### 4.5.1 Overview

Santos has a well-established methodology for identifying and determining relevant persons (agency, authority, organisation or person) for consultation.

This methodology draws on Santos' extensive historic consultation, while considering the nature of the Activity, the environment in which the Activity is being undertaken and the possible impacts and risks of the Activity, in order to identify relevant persons within the meaning of section 25 of the OPGGS(E)R.

Santos consults to ensure that any Activity it is proposing under an EP is carried out in a manner:

- consistent with the principles of ecologically sustainable development set out in section 3A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- by which the environmental impacts and risks of the proposed activity will be reduced as low as reasonably practicable (ALARP)
- by which the environmental impacts and risks of the proposed activity will be of an acceptable level.

The consultation process is designed to assist Santos to further ascertain, understand and assess values and sensitivities of the environment that may be affected by a proposed Activity and the potential environmental impacts and risks, through information obtained during consultations.

Such environment (and values and sensitivities thereof) includes:

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage value of places; and

- the social, economic and cultural features of the aspects mentioned above.

Santos may then refine or change its proposed control measures to address potential environmental impacts and risks of the proposed Activity based on that information or any claims or objections raised through consultation.

Santos' consultation methodology and process adopted in developing this EP comprised these key steps:

**Consultation planning**

- Considering the values and sensitivities of the environment, including its social, economic and cultural features, as described in Section 3.
- Identifying relevant persons for consultation, having regard to the kinds of functions, interests and activities that may be affected by impacts from planned activities and risks of unplanned events, including having regard to historic consultation for other environment plans that may be relevant to understanding this. See Table 4-6 and Table 4-7 for a list of authorities, persons and organisations consulted for this EP.
- Considering the spatial extent of the:
  - Operational Areas as defined in Section 2.1.1, Figure 2-1, and any other areas where environmental impacts occur from planned activities. These impacts are described and evaluated in Section 6.
  - EMBA as defined in Section 3.1 and the nature and extent of potential impacts from unplanned events within that area. These potential impacts are described and evaluated in Section 7.
- Developing consultation materials to support an informed assessment by relevant persons identified for consultation of the possible consequences of the proposed activity on their functions, interests or activities and to outline how to provide input to Santos.
- Developing a public awareness campaign targeted at coastal communities proximate to the perimeter of the EMBA as described in Section 3.1, to promote awareness about the proposed activity and publicise consultation opportunities for potentially relevant authorities, persons and organisations.

**Consultation**

- Undertaking consultation with relevant persons identified for consultation that is appropriate, having regard to the environmental impacts and risks of the proposed activity, is appropriate and adapted to the nature of each authority, person or organisation identified for consultation, and which involves:
  - providing sufficient information for the relevant person to make an informed assessment of potential consequences of the proposed activity on their functions, interests or activities; and
  - providing a reasonable timeframe for the relevant person to review, consider, and respond to the information provided.
- Providing statements in its consultation materials and discussed at consultation sessions that relevant persons could request that information they provide not be published and that, if so requested, Santos would ensure that information is included in a separate report which is not published on NOPSEMA's website.
- Assessing the merits of claims or objections made by relevant persons about possible adverse impacts and risks of each activity to which the EP relates and providing responses to queries, requests and feedback, as summarised in Appendix F.
- Determining what (if any) additional measures are to be taken to bring environmental impacts/risks of the proposed activity to ALARP and acceptable levels.
- Documenting and appropriately storing the consultation outcomes in Santos' designated central management system.

**Environment Plan development**

- Providing in this EP a report on all consultation undertaken under section 25, in accordance with section 24(b) of the OPGGS(E)R. See Appendix F.
- Updating this EP, as required, in light of the consultation described above.
- Developing a strategy for appropriate consultation with relevant government authorities and other relevant interested persons or organisations over the life of the EP. Refer implementation strategy, Section 8.

### 4.5.2 Consultation planning

Santos has considered NOPSEMA's Guideline, *Consultation in the course of preparing an environment plan* (May 2024a) with respect to identifying relevant persons for consultation and undertook the following steps in the consultation planning phase.

This Guideline affirms the importance of consultation to inform the management of environmental impacts and risks to which the activity and environment plan relate.

#### 4.5.2.1 Consideration of historic consultation

Santos has a long history of consultation to support exploration in the Bedout Basin, with a number of marine seismic activities undertaken and 11 wells drilled.

Santos' has considered the input received from these historical consultations and other regionally proximate or activity analogous consultations to inform who maybe a relevant person and to inform their consultation preferences (i.e. how they prefer to be consulted). These historical consultations have demonstrated that:

- those relevant persons with potentially affected functions, interests or activities at or proximate to the operational area are likely to provide feedback on planned activity impacts and risks.
- those relevant persons with potentially affected functions, interests or activities more remote from the operational area are likely to provide feedback on activity risks only.

A sample of feedback from historic consultation that has been considered when identifying relevant persons is provided by way of example in Table 4-3, noting that feedback on:

- impacts from planned activities typically relate to physical presence, disturbance to the environment and ecological impacts to protected or totemic species.
- potential impacts from unplanned events typically relate to activity notifications in the event of a spill or opportunities to participate in oil spill response, as well as disturbance to the environment and ecological impacts to protected or totemic species.

**Table 4-3: Historic consultation**

| Relevant person category | Feedback | Consultation example references |
|---|---|---|
| Government authorities with responsibilities for protected species and marine and terrestrial park management | Feedback has focused on impacts from planned activities to sensitive receptors, such as biologically important areas and key ecological features.<br>These authorities have also sought to be notified in the event that a spill has potential to impact these receptors. | Refer Director of National Parks for Reindeer Wellhead Platform and Gas Supply Pipeline Operations and Cessation of Production Environment Plan in relation to comments provided on the overlap of the activity with a marine park and emergency response notifications.<br>Refer Department of Biodiversity, Conservation and Attractions for the Ningaloo Vision Cessation of Production and Floating Asset Removal Environment Plan with reference to petroleum production activities in proximity to ecologically sensitive receptors. |
| Government authorities with responsibilities for management of commercial fishing | Feedback has focused on impacts from planned activities, including the physical presence whereby fishers may be displaced from day-to-day activities, or where impacts, such as light and noise, may result in the in the dispersal of target species.<br>These authorities have also sought to be notified in the event that a spill has potential to impact fishers, including ecological impacts to spawning areas and nursery grounds from a spill. | Refer Australian Fisheries Management Authority for Eos 3D Marine Seismic Survey Environment Plan in relation to impacts from planned activities.<br>Refer Department of Primary Industries and Regional Development for Eos 3D Marine Seismic Survey Environment Plan in relation to impacts to fishing in the operational area and spill contingency planning. |
| Government authorities with responsibilities management of maritime safety | Feedback has focused on impacts from planned activities, including the physical presence of petroleum activities that may impact maritime safety.<br>These organisations typically have not provided feedback with respect to potential impacts from unplanned events. | Refer Australian Maritime Safety Authority for the Reindeer Wellhead Platform and Gas Supply Pipeline Operations and Cessation of Production Environment Plan in relation to impacts to commercial shipping from planned activities. |
| Government authorities with responsibilities management of submerged cultural heritage | Feedback has focused on physical impacts to places of cultural significance. | Refer Department of Climate Change, Energy, the Environment and Water for Barossa Production Operations Environment Plan in relation to Underwater Cultural Heritage Act protections, key responsibilities and obligations, management |

| Relevant person category | Feedback | Consultation example references |
|---|---|---|
| | | considerations and recommendations in operational area.<br>Refer Department of Planning, lands and Heritage for the Halyard-2 Drilling & Completions Environment Plan in relation to operational area overlap with registered sites in the Aboriginal Cultural Heritage Directory.<br>Refer WA Museum for the Halyard-2 Drilling & Completions Environment Plan in relation to identifying and managing impacts and risks to Aboriginal and non-Aboriginal underwater cultural heritage within the operational area. |
| Energy industry organisations | Feedback has focused on physical impacts to other operator infrastructure due to the physical presence of proposed Santos activities.<br>These organisations typically have not provided feedback with respect to potential impacts from unplanned events. | Refer Chevron for Halyard-2 Drilling and Completions EP (Cth) in relation to potential impacts to Chevon assets resulting from operational activities. |
| Environmental conservation organisations | Feedback has focused on ecological impacts to protected species and climate change matters.<br>These organisations have requested to be notified of when activities are initiated and/or completed. | Refer Exmouth Community Liaison Group for Ningaloo Vision Cessation of Production and Floating Asset Removal Environment Plan in relation to collapse of a production flowline and the potential for a release of hydrocarbons to the environment.<br>Refer Care for Hedland for Halyard-2 Drilling & Completions Environment Plan in relation to be sent activity notifications. |
| First Nations people and organisations | Feedback from First Nations people and organisations has focused on ecological impacts from planned activities to totemic species, such as turtles and whales.<br>Feedback from these organisations has also focused on the potential impacts from unplanned events to inshore/coastal cultural heritage (registered sites and places of importance). Importantly, these groups sought opportunities to support spill response efforts.<br>Feedback from these organisations has also focused on potential impact to intangible cultural features where new infrastructure has been proposed or due to the presence of equipment. Potential impacts to intangibles have not been a focus in WA for Santos where proposed activities have to date been temporary (e.g. short-duration exploration activities),or associated with existing operations or the removal of infrastructure for proposed decommissioning. | Refer to First Nations people and groups for Barossa Production Operations Environment Plan in relation to impacts from planned activities to turtles, whales and dugongs.<br>Refer to Wanparta Aboriginal Corporation for Halyard-2 Drilling & Completions Environment Plan in relation to the protection of places of importance in the event of a spill and opportunities for Wanparta rangers to support spill response<br>Refer Kariyarra Aboriginal Corporation for this EP in relation to the protection of places of importance in the event of a spill.<br>Refer to feedback from Tiwi clans and people about 'intangible cultural features' in relation to the construction of infrastructure and the presence of equipment for the Barossa Gas Project. |
| Local Government Authorities | Feedback has focused on local business opportunities where these authorities are proximate to the operational area.<br>Feedback has focused potential impacts from unplanned events where these authorities are remote to the operational area. | Refer to Town of Port Hedland for this EP with respect to impacts to town infrastructure and community economic wellbeing.<br>Refer to Shire of Manjimup for Halyard-2 Drilling & Completions Environment Plan in relation to potential impacts from a spill event. |
| Marine and/or coastal tourism organisations – e.g. dive charter, fishing charter, whale watching tours. | These organisations typically have provided feedback with respect to impacts from planned activities where the activity is proximate.<br>These organisations typically have not provided feedback with respect to potential impacts from unplanned events. | Refer to Equinox Fishing Charters in the Barossa Production Operations Environment Plan in relation to potential impacts on fishing.<br>Refer to Fish the Top End Fishing Charters in the Barossa Production Operations Environment Plan in relation to not having feedback on the environment plan as it did |

| Relevant person category | Feedback | Consultation example references |
|---|---|---|
| | | not affect their functions, interests or activities. |
| Recreational and community organisations | Feedback from recreational fishing industry representative organisations has focused on ecological impacts to target species from activity impacts, with requests for as well as ecological impacts from a spill.<br>These organisations have also requested Santos to directly consult recreational clubs most proximate to the operational area. | Refer to Recfishwest for WA-20-L Environment Plan in relation organisation advice to consult recreational fishing clubs most proximate to proposed activities.<br>Refer to Margaret River Chamber of Commerce and Industry for Mutineer Exeter Plug and Abandonment Environment Plan in relation to how the WA South West could be affected by proposed activities. |
| Research organisations. | Feedback from research organisations has focused on physical presence and on-water interactions.<br>These organisations typically have not provided feedback with respect to potential impacts from unplanned events. | Refer to Australian Marine Sciences Association NT for the Barossa Production Operations Environment Plan in relation to feedback on ensuring surveys are held to protect biologically important areas. |

#### 4.5.2.2 Consideration of the operational area and EMBA

In terms of geographical extent, impacts from planned activities are generally limited to the OA, except in that lighting impacts can extend to areas beyond the OA, but still within a 20 km buffer zone (Section 6.3).

Risks from unplanned events may be expected to extend beyond this, to other areas of the EMBA, as described in Section 3.1.

Santos notes that there is significant conservatism associated with the spill modelling that has been primarily used to inform Santos' preparedness for potential spill response and does not take into account the suite of mitigations described in the OPEP that would be implemented and reduce the EMBA extent in the unlikely event of a spill.

Santos, therefore, has considered the geographical extent of the EMBA to assist in identify whether an Activity may be relevant to authorities, and to assist in identifying who are relevant persons that may be affected by the Activity as described in Section 2 of this EP.

Where Santos identified a relevant agency or authority or a person or organisation with functions, interests or activities within the EMBA that may be affected by the activity, Santos has consulted that relevant person for the purposes of section 25 of the OPGGS(E)R.

This planning approach is further supported by learnings from historical consultation undertaken by Santos (described in Section 4.5.2.1) for other EPs, which has shown the main interest from relevant persons have generally been limited to:

**Impacts from activities**

This includes impacts to environmental values and sensitivities that intersect the operational area, as well as potential on-water interactions with other marine users (the presence of vessels) undertaking petroleum activities.

First Nations people and groups have also consistently expressed interest in impacts from planned activities (e.g. noise, light, vessel or infrastructure presence) on tangible cultural features (e.g. totemic species) and intangible features.

**Risks from unplanned events**

Where relevant persons have been interested in activity risks, specifically in relation to spills from unplanned events, Santos' experience is that the interest from authorities, persons and organisations has generally been limited to:

- potential ecological impacts to:
  - fish and other species targeted by commercial and recreational fishers
  - protected marine species of interest to government agencies, and academic and research organisations
  - protected areas of interest to government agencies, communities and environmental conservation groups
  - totemic marine species of cultural importance to First Nations peoples
- the protection of areas of cultural importance, most noticeably those areas where impacts may result from shoreline hydrocarbon contact.

As such this historical consultation has informed the fact that potential impacts from surface and dissolved hydrocarbons as well as shoreline accumulation of hydrocarbons, need to be considered when identifying relevant persons, and the EMBA (as described in Section 3.1.1) is the geographical extent of these using low thresholds.

In addition, our approach to determine who maybe a relevant person for the purpose of consultation for this EP has also considered:

1. NOPSEMA guidance with respect to considering and consulting (for the purpose of section 25(1)(a) and (b) of the OPGGS(E)R):
   - Each Commonwealth and WA Government agency or authority to which the activities to be carried out under the environment plan may be relevant;
   - The Department of the responsible WA Government Minister.
2. NOPSEMA guidance with respect to considering and consulting (for the purpose of section 25(1)(d)) persons or organisations whose functions, interests or activities may be affected by the activities to be carried out under the environment plan.
3. Potentially relevant persons who have self-identified, as supported by our public awareness campaigned outlined below.

Santos has considered this guidance and reviewed values and sensitivities of the environment, including its social, economic and cultural features, as described in Section 3.2 and mapped these values and sensitivities to:

- Government departments or agencies who have authorities or responsibilities with respect to the proposed Activity or the values and sensitivities present in the EMBA, such as regulation and management of commercial fisheries, marine parks, maritime safety, defence activities, etc.
- Persons and organisations (inclusive of representative organisations) who have authorisations to undertake certain activities or have other activities, functions or interests within the Operational Areas and the EMBA, such as First Nations people and organisations, commercial fishers, recreational fishing organisations, other recreational, community and infrastructure organisations, other affected businesses, etc.

Actions undertaken in the mapping review are described in Table 4-4.

**Table 4-4: Actions to identify authorities, persons and organisations for consultation**

| Categories of authorities | Actions to identify authorities, persons and organisations for consultation |
|---|---|
| Department or agencies of the Commonwealth | • Review of the geographical extent of impacts and risks to environmental, social, economic and cultural values and sensitivities.<br>• Review of government agency websites and directories to understand agency roles, functions and responsibilities.<br>• Review of government department and agency guidance on consultation expectations. |
| Department or agencies of Western Australia | • Review of the geographical extent of impacts and risks to environmental, social, economic and cultural values and sensitivities.<br>• Review of government agency websites and directories to understand agency roles, functions and responsibilities.<br>• Review of government department and agency guidance on consultation expectations. |
| Commercial fishing organisations | • Review of the spatial overlap of the Operational Areas and EMBA with Commonwealth and WA Government commercial fisheries.<br>• Review of Commonwealth and WA Government commercial fishing catch and effort data. |
| Energy industry organisations<br>• Offshore petroleum<br>• Electricity generation (renewables)<br>• Carbon capture and storage | • Review of the spatial overlap of the Operational Areas and EMBA with petroleum, greenhouse gas and any other National Offshore Petroleum Titles Administrator (NOPTA) issued titles. |
| First Nations people and organisations | • Review of the spatial overlap and proximity of the Operational Areas and EMBA with:<br>– Native Title determined areas and claims<br>– Indigenous land use agreements (ILUAs)<br>– Land rights and Indigenous Protected Areas (IPAs)<br>• Review of the spatial overlap and proximity of the Operational Areas and EMBA to Representative Aboriginal/Torres Strait Island Bodies (RATSIBs) Areas. |

| Categories of authorities | Actions to identify authorities, persons and organisations for consultation |
|---|---|
| | • Review of the spatial overlap and proximity of the Operational Areas and EMBA with registered sites of cultural heritage.<br>• Review of marine park management plans relevant to the Operational Areas and EMBA.<br>Further details on activities to identify First Nations people and groups is described in Section 4.5.2.4. |
| Infrastructure organisations | • Review of the spatial overlap of the Operational Areas and EMBA with offshore and onshore infrastructure, such as submarine telecommunications cables. |
| International persons | • Review of the spatial overlap of the Operational Areas and EMBA international marine and terrestrial interests.<br>Further details on activities to identify international persons is described in Section 4.5.2.5. |
| Local Government Authorities | • Review of the spatial overlap of the Operational Areas and EMBA with boundaries of local government areas. |
| Maritime safety organisations and port authorities | • Review of the spatial overlap of the Operational Areas and EMBA with offshore maritime areas, such as shipping fairways, and nearshore maritime areas, such as port jurisdictions. |

4. The above was supplemented by online searches used to identify relevant persons in the following category groups who may have functions, interests or activities that may be affected by the proposed Activity in the Operational Area or the broader EMBA:
   - Academic organisations
   - Research organisations.
   - Environmental conservation organisations.
   - Marine and/or coastal tourism organisations – e.g. dive charter, fishing charter, whale watching tours.
   - Recreational and community organisations – i.e. recreational fishing clubs, representative community organisations with a consultative role (e.g. Energy Operators Exmouth Community Liaison Group).
5. For all category groups Santos also reviewed the following to further inform its identification of authorities, persons and organisations for consultation in the course of preparing this EP:
   - published NOPSEMA and industry guidance relevant to consultation as described in Section 4.3.
   - publicly available EPs submitted by other Titleholders that may be relevant to proposed activities to be managed under this EP.
6. During the consultation period, Santos also asked identified authorities, persons and organisations if there were other authorities, persons or organisations who may need to be consulted.

Lists of authorities, persons and organisations consulted for this EP is included at Table 4-6 and Table 4-7.

#### 4.5.2.3 Public awareness campaign

In addition to undertaking the process for identification of authorities, persons and organisations for consultation, as described above, Santos undertook a range of activities to promote opportunities for potential authorities, persons and organisations to self-identify for consultation if they felt that their functions, interests or activities may be affected by the proposed activity. This approach has ensured a broad capture of potential Relevant Persons and provided them an opportunity to provide input if they feel their functions, interests or activities may be impacted.

These promotional activities include public information campaigns using a range of delivery methods, including radio advertising, print advertising and targeted social media with links (where appropriate) to provide information about the proposed activity and its potential environmental risks and impacts.

Details of the public information campaign for this EP, including targeted efforts to provide First Nations organisations and individuals the same opportunities, is included in Table 4-5.

Such activities and information sharing provided a more than reasonable opportunity for organisations and individuals to self-identify for the purpose of OPGGS(E)R consultation, where they consider themselves to have interests or activities that may be affected by the proposed activities and to provide input.

Santos' consultation process involves the provision of reasonable timeframes for the self-identification or nomination of others for consultation, to consider consultation information, ask questions and give input and for Santos to consider and assess the merits of any objections and claims.

For this EP, no authorities, persons or organisations self-identified for consultation.

**Table 4-5: Summary of public awareness campaign**

| Publication date | Media outlet | Towns / Communities distribution area | Reach |
|---|---|---|---|
| **Social media** | | | |
| 31 July – 22 August 2025 | Facebook, Instagram and Messenger | Geotargeted PPL18+ Carnarvon, Exmouth, Onslow, Karratha, Port Hedland, Broome | N/A |
| **Radio advertising and social media** | | | |
| 27 July – 24 August 2025 | Karratha HIT 106.5 | Karratha towns and communities, focusing on remote communities | N/A |
| 27 July – 24 August 2025 | WA Remote HIT WA FM | WA remote towns and communities | N/A |
| 27 July – 24 August 2025 | MMM | WA remote towns and communities | N/A |
| 27 July – 24 August 2025 | Broome HIT 101.3 | WA remote towns and communities | N/A |
| 27 July – 24 August 2025 | Pilbara and Kimberley Aboriginal Media Radio | Pilbara and Kimberley towns and communities, focusing on remote communities | N/A |
| **Print advertising** | | | |
| 23 July 2025 | North West Telegraph | Port Hedland area<br>Half page, page 4 | Targeted WA with reach of 8,154 |
| 23 July 2025 | Pilbara News | Dampier, Exmouth, Karratha, Onslow and Port Hedland areas<br>Half page, page 6 | Targeted WA with reach of 17,611 |
| 24 July 2025 | The West Australian | Statewide area<br>Half page, page 11 | Targeted WA with reach of 359,000 |
| 24 July 2025 | Broome Advertiser | Broome and Derby areas<br>Half page, page 11 | Targeted WA with reach of 14,474 |

#### 4.5.2.4 Identification and Consultation with First Nations People and Groups

Santos acknowledges the tradition of First Nations people of Australia includes a cultural and spiritual connection to their land and waters and that communal cultural interests, including sea country interests, could extend into the EMBA, and as such the above identification steps considers the potential for sea country.

As part of the identification steps set out above, Santos has developed a comprehensive and adaptive process for identifying and undertaking effective consultation with First Nations relevant persons.

As with Santos' process for identifying relevant persons and organisations generally, this is an iterative process with multiple avenues of enquiry including the information review steps described in Section 4.5.2 as well as, but not limited to, these actions:

- Identifying First Nations relevant persons and organisations, whose functions, interests and activities are in areas where they may be affected by the proposed Activity and providing opportunities to provide input in EP development. These organisations include:
  - Registered Native Title Prescribed Bodies Corporate (PBCs) associated with Native Title Determinations
  - Native Title Claim groups
  - Native Title Representative Bodies in their own capacity, as well as in their capacity where PBCs have nominated them as their preferred contact for consultation
  - PBCs or groups who may be parties to relevant Indigenous Protected Areas, or named in Indigenous Land Use Agreements
  - Existing relevant liaison committees or reference groups, where these committees or groups have been established between Native Title Parties, Native Title Representative Bodies and industry/government
  - Other representative First Nations organisations
  - Individual First Nations people or organisations who self-identify as relevant persons or organisations (if any)

Asking identified persons and organisations (including relevant Native Title Representative Bodies and land councils) if there are other persons or organisations who ought to be considered for consultation.

Advertising broadly to ensure that relevant persons and organisations that are not otherwise identified by Santos, are given the opportunity to self-identify.

The above has included Santos providing consultation opportunities to Native Title Representative Bodies and PBCs noting that they are well placed to represent certain Native Title holders and provide relevant input, noting their responsibilities under the *Native Title Act 1993* (Cth) for representing Native Title holders whose rights and interests in respect of traditional land and waters have been recognised under Australian law and that the vast majority of the Western Australian coastline is settled under the native title regime.

Further, native title holders may decide that they also wish their PBC to engage in a broader range of activities, not directly related to the management of native title, such as social and economic development for their communities. As such, PBCs are the first point of contact for government and other parties wishing to undertake activities that have implications for recognised traditional lands and waters.

This means that the process for consultation in Western Australia places greater emphasis on, but is not limited to, Native Title Representative Bodies and PBCs.

Santos recognises that Native Title Representative Bodies and PBCs are bound by the traditional laws and customs of the native title group they represent. This includes, among other things, in respect of management and protection of cultural values.

In addition to the above and feedback from historical consultations, since mid-2023 Santos has been actively working with Native Title Representative Bodies and PBCs to confirm that it is appropriate to consult with them on behalf on traditional owners and other first nation individuals and understand their preference on how to consult. For PBCs this typically occurs at PBC Board level, in recognition of the role that elected Board Directors have in representing the Native Title holders.

This includes establishing and maintaining consultation agreements (which we complied with) to support ongoing, regular and effective consultation and engagement activities. These consultation agreements generally also outline the process to determine the need for community meetings to provide additional information to individuals.

For this EP, after applying the above processes, Santos has provided consultation opportunities and supporting information to First Nations relevant persons (i.e. authorities, persons and organisations) for the purpose of assisting to identify and appropriately consulting with relevant authorities and relevant persons and organisations.

This conservative approach has ensured a very broad capture of relevant persons for consultation and provided them an opportunity to provide input if they feel they may be impacted.

In addition, consultation with First Nations relevant persons and organisations on this EP has been actioned by Santos sending emails to PBCs and Native Title Representative Bodies to forward the consultation information and invitations to consult with their communities and members. For reference:

- Kimberley Land Council is the Native Title Representative Body for the Kimberley Native Title Representative Body Area and is mandated to assist native title claimants and holders. From its website, the Kimberley Land Council works with Aboriginal people of the Kimberley to secure native title, conduct conservation and land management activities and develop cultural business enterprises.
- Yamatji Marlpa Aboriginal Corporation is the Native Title Representative Body for the Geraldton (Yamatji) and Pilbara Native Title Representative Body Areas. From its website, the Yamatji Marlpa Aboriginal Corporation services include native title claim and future act representation; heritage services; executive office, community, and economic development assistance; land administration, and natural resource management support.

Based on Santos' consultation experience, the likelihood of First Nations people having sea country or other interests (or activities or functions) that may be affected by the proposed Activities becomes increasingly unlikely with increasing distance from the Operational Area given the remote possibility of any major unplanned spill event, and the inherent conservatism of modelling from which the EMBA is determined. Santos applies this experience to identification of First Nations relevant persons and organisations with respect to people or groups named in Marine Park Management Plans.

As a result, Santos have consulted with First Nations relevant persons and organisations where the areas in respect of which they have functions, interests or activities are understood to be in or proximal to the EMBA but have not consulted with First Nations relevant persons and organisations where the areas in respect of which they have functions, interests or activities are understood to remote from where the EMBA intersects.

It is on this basis some groups referenced in Section 3.2.7.1.2 as being mentioned in Marine Park Management Plans, but have not been consulted for this EP, while others have. For example, the EMBA overlaps a small area in the west of the Kimberley Marine Park. The management plan for this park refers to the Wunambal Gaambera, Dambimangari, Mayala, Bardi Jawi and the Nyul Nyul people as having sea country interests within the park. However, the management plan does not provide detail on where these interests are within the park, which covers

an area of ~75,000 $m^2$ and stretches >700 km from south-west to north-west boundaries. Santos then reviewed the published interests of these groups to understand interests within or proximate to the EMBA as a basis for consultation. Those groups consulted are included in Table 4-6, noting the groups' preferred organisation for consultation. Notwithstanding this assessment, Santos' approach was supplemented by its broad-reaching promotional campaign, which also extended to remote areas.

#### 4.5.2.5 Identification and Consultation with international persons

With regard to the location of the proposed activities, there are no impacts from planned activities that may affect the functions, interests or activities of international authorities, persons and organisations (see map of OA in Figure 2-1).

However, the worst-case credible spill scenario modelled for this EP indicates a possibility that international waters could be in contact with residual entrained or floating hydrocarbons. The modelling indicates overlap with international waters at the outer extremities of the EMBA (see map of EMBA in Figure 3-1).

As stated in Section 4.5.2.1 there is significant conservatism associated with the spill modelling and it does not take into account the suite of mitigations described in the OPEP that would be implemented and reduce the EMBA extent in the unlikely event of a spill.

Therefore, no international relevant authorities or relevant persons or organisations have been identified for consultation.

Notwithstanding this, Santos has consulted the Department of Foreign Affairs and Trade (DFAT) which has a function in coordinating and facilitating communication between Australia and international governments to invite any relevant input that DFAT might have.

#### 4.5.2.6 Authorities, persons and organisations consulted

Santos developed a preliminary list of relevant persons for consultation as result of activities outlined in Section 4.5.2.2 to Section 4.5.2.5.

No relevant persons self-identified as a result of the public awareness campaign as described in Section 4.5.2.3.

The final list of Commonwealth and Western Australian authorities consulted for this EP as determined by application of the above described process is included in Table 4-6 and the final list of persons and organisations consulted for this EP is included in Table 4-7.

**Table 4-6: Authorities consulted for this EP**

| Department or Agency | Authority Description |
|---|---|
| **Commonwealth** | |
| Australian Border Force | Australian Border Force is Australia's border law enforcement Commonwealth Government agency and customs service. |
| Australian Communications and Media Authority | Australian Communications and Media Authority is a Commonwealth Government agency that regulates communications and media services in Australia. |
| Australian Fisheries Management Authority | Australian Fisheries Management Authority is a Commonwealth Government agency responsible for the efficient management and sustainable use of Commonwealth fish resources. |
| Australian Hydrographic Office | Australian Hydrographic Office is a Commonwealth Government agency supporting safe maritime navigation. |
| Australian Institute of Marine Science | Australian Institute of Marine Science is a Commonwealth Government agency that leads tropical marine research, delivering innovative insights and solutions for Australia's vast and diverse marine ecosystems. |
| Australian Maritime Safety Authority – Marine Pollution | Australian Maritime Safety Authority – marine pollution is a Commonwealth Government agency that oversees maritime safety, vessel emergencies, and marine pollution prevention in Australian waters. |
| Australian Maritime Safety Authority – Maritime Safety | Australian Maritime Safety Authority – maritime safety is a Commonwealth Government agency that is responsible for maritime safety, vessel emergencies, and preventing ship-sourced pollution in Commonwealth waters. |
| Department of Agriculture, Fisheries and Forestry – Biosecurity marine pests | Department of Agriculture, Fisheries and Forestry – Biosecurity is a Commonwealth Government agency that leads a National System with governments, industries, and scientists to prevent, manage, and minimise the impact of marine pests in Australia. |
| Department of Agriculture, Fisheries and Forestry – Fisheries Division | Department of Agriculture, Fisheries and Forestry – Fisheries is a Commonwealth Government agency that coordinates with governments, industry, scientists, and |

| Department or Agency | Authority Description |
|---|---|
| | stakeholders to sustainably manage Australia's fisheries through regulations and catch limits. |
| Department of Climate Change, Energy, the Environment and Water – Director of National Parks | Department of Climate Change, Energy, the Environment and Water – Director of National Parks is a Commonwealth Government agency established under the *Environment Protection and Biodiversity Conservation Act 2005* (Cth) to manage Commonwealth reserves to guide protected area policies and priorities. |
| Department of Climate Change, Energy, the Environment and Water – Underwater Cultural Heritage | Department of Climate Change, Energy, the Environment and Water – Underwater Cultural Heritage is a Commonwealth Government agency that protects Australia's natural environment and heritage, addresses climate change, manages resources, and administers the *Underwater Cultural Heritage Act*. |
| Department of Defence | Department of Defence is a Commonwealth Government agency that safeguards Australia's national interests, security, and stability by managing the military forces and coordinating defence policies and operations. |
| Department of Foreign Affairs and Trade | Department of Foreign Affairs and Trade is a Commonwealth Government agency that advances Australia's security and prosperity by fostering international partnerships, trade, stability, and support for Australians abroad. |
| Department of Industry, Science and Resources | Department of Industry, Science and Resources is a Commonwealth Government agency that drives innovation, industry growth, and investment while regulating mineral and energy resources in Australia. |
| Fisheries Research and Development Corporation | Fisheries Research Development Corporation is a Commonwealth Government agency that funds research and innovation to enhance the sustainability, productivity, and profitability of Australia's fisheries in collaboration with government and industry. |
| Indigenous Land and Sea Council | Indigenous Land and Sea Council (ILSC) is a corporate Commonwealth entity established under the *Aboriginal and Torres Strait Islander Act 2005* (Cth). The ILSC aids with acquiring and managing rights and interests in land, salt water and freshwater country. |
| National Indigenous Australians Agency | The National Indigenous Australians Agency is a Commonwealth Government Agency that coordinates government policy, programs, and services for Indigenous Australians. |
| Regional Development Australia – Mid West Gascoyne | Regional Development Australia – Mid West Gascoyne is a Western Australia State Government agency that is a collection of local leaders collaborating to enhance the Mid West and Gascoyne regions, reporting to the Commonwealth Minister. |
| Regional Development Australia – Pilbara | Regional Development Australia – Pilbara is a Western Australia State Government agency that works to develop the Ashburton, East Pilbara, Karratha, and Port Hedland areas, reporting to the Commonwealth Minister. |
| **Western Australia** | |
| Department of Biodiversity, Conservation and Attractions | Department of Biodiversity, Conservation and Attractions is a Western Australia State Government agency manages State marine parks, reserves, and protected marine wildlife in Western Australia. |
| Department of Creative Industries, Tourism and Sport (formerly Department of Jobs, Tourism, Science and Innovation) | The Department of Creative Industries, Tourism and Sport supports is a Western Australia State Government agency that regulates Western Australia's creative, tourism, sport, and multicultural sectors to promote growth, participation, and safety. |
| Department of Mines, Petroleum and Exploration (formerly Department of Energy, Mines, Industry Regulation and Safety) | The Department of Mines, Petroleum and Exploration is a Western Australia State Government agency responsible for regulating and managing the state's energy, mining, and industrial sectors, |
| Department of Planning, Lands and Heritage | Department of Planning, Lands and Heritage is a Western Australia State Government agency that manages land use, heritage, and Aboriginal affairs within Western Australia. |
| Department of Primary Industries and Regional Development – Fisheries | Department of Primary Industries and Regional Development – Fisheries is a Western Australia State Government agency that regulates and advances agriculture, fisheries, and regional development in Western Australia. |
| Department of Transport and Major Infrastructure – Marine pollution | Department of Transport and Major Infrastructure – marine pollution is a Western Australia State Government agency that manages commercial vessel movements and leads marine pollution emergency responses in WA state waters. |
| Department of Water and Environmental Regulation | Department of Water and Environmental Regulation is a Western Australia State Government agency that supports environmental impact assessments, policy development, and compliance monitoring to protect WA's environment. |

| Department or Agency | Authority Description |
|---|---|
| Gascoyne Development Commission | Gascoyne Development Commission is a Western Australia State Government agency that facilitates and monitors economic and social development in the Gascoyne region of WA. |
| Ningaloo Coast World Heritage Advisory Committee | Ningaloo Coast World Heritage Advisory Committee is a Western Australia State Government agency that advises governments on protecting and managing the World Heritage values of the Ningaloo Coast. |
| Pilbara Development Commission | Pilbara Development Commission is a Western Australia State Government agency that focuses on the economic and social development of the Gascoyne region. |
| Pilbara Ports Authority | Pilbara Ports Authority is a Western Australia State Government agency that manages and operates port infrastructure in the Pilbara region. |
| Shark Bay World Heritage Advisory Committee | Shark Bay World Heritage Advisory Committee is a Western Australia State Government agency advising federal and state environment ministers on protecting and managing Shark Bay's World Heritage values. |
| Western Australian Museum | Western Australian Museum is a Western Australia State Government agency that maintains a database of shipwrecks along the WA coast. |

**Table 4-7: Persons or organisations consulted for this EP**

| Organisation | Description |
|---|---|
| **Academic Organisations** | **Organisation Description** |
| Curtin University (Centre for Marine Science and Technology) | Curtin University (Centre for Marine Science and Technology) is an academic research organisation. |
| Edith Cowan University<br>(Centre for Marine Ecosystems Research) | Edith Cowan University (Centre for Marine Ecosystems Research) is an Academic research organisation. |
| James Cook University | James Cook University is an academic research organisation. |
| Murdoch University | Murdoch University is an academic research organisation. |
| University of Western Australia (Oceans Institute) | University of Western Australia (Oceans Institute) is an academic research organisation. |
| **Commercial Fishing Organisations** | |
| **Commonwealth Fisheries** | |
| Commonwealth fisheries that spatially overlap the EMBA are described in Section 3.2.7.3. Of these, none have been active in the OA.<br>In line with Santos' consultation methodology consultation has been undertaken with relevant government authorities and commercial fishing representative organisations acknowledging the potential impact to all identified fisheries in the unlikely event of a spill. | Commonwealth fishery government authorities and representative organisations are listed elsewhere in this table. |
| **WA Fisheries** | |
| WA fisheries that spatially overlap the EMBA are described in Section 3.2.7.3. Of these, the following fisheries have been active in the OA:<br>• Mackerel Managed Fishery (Area 2)<br>• Pilbara Fish Trawl Interim Managed Fishery<br>In line with Santos' consultation methodology consultation has been undertaken with licence holders in these fisheries who may be affected by impacts from planned activities. | WA fishery government authorities and representative organisations are listed elsewhere in this table. |

| Organisation | Description |
|---|---|
| Santos has also consulted relevant government authorities and commercial fishing representative organisations acknowledging the potential impact to all identified fisheries in the unlikely event of a spill. | |
| **Energy Industry Organisations** | |
| 3D Energi | 3D Energi is an Energy industry titleholder. |
| Beagle No.1 Pty Ltd | Beagle No. 1 P/L is an Energy industry titleholder. |
| BP Developments Australia | BP Developments Australia is an Energy industry titleholder. |
| Chevron Australia | Chevron Australia is an Energy industry titleholder/licence holder. |
| deepCstore | deepCstore is an Energy industry licence holder. |
| Finder Energy Holdings Ltd | Finder Energy Holdings Ltd is an Energy industry titleholder. |
| InCapture P/L | InCapture is a Greenhouse Gas Licence holder. |
| INPEX | INPEX is an Energy industry titleholder. |
| Jadestone Energy (Australia) Pty Ltd | Jadestone Energy (Australia) Pty Ltd is an Energy industry titleholder. |
| KATO Energy | KATO Energy is an Energy industry titleholder. |
| KUFPEC Australia Pty Ltd | KUFPEC Australia Pty Ltd is an Energy industry titleholder. |
| Melbana Energy Ltd | Melbana Energy Ltd is an Energy industry titleholder. |
| Pathfinder Energy Pty Ltd | Pathfinder Energy Pty Ltd is an Energy industry titleholder. |
| Vermilion Oil & Gas | Vermilion Oil & Gas is an Energy industry titleholder. |
| Western Gas Pty Ltd | Western Gas Pty Ltd is an Energy industry titleholder. |
| Woodside Energy Group Ltd | Woodside Energy Group Ltd is an Energy industry titleholder/licence holder. |
| **Environmental Conservation Organisations (Non-Government)** | |
| Australian Conservation Foundation | Australian Conservation Foundation is a non-Government environmental conservation organisation. |
| Australian Marine Conservation Society | Australian Marine Conservation Society is a non-Government environmental conservation organisation. |
| Cape Conservation Group | Cape Conservation Group is a non-Government environmental conservation organisation. |
| Care for Hedland Environmental Association | Care for Hedland Environmental Association is a non-Government environmental conservation organisation. |
| Conservation Council of WA | Conservation Council of WA is a non-Government environmental conservation organisation. |
| Coral Bay Progress Association | The Coral Bay Progress Association is a non-Government environmental conservation organisation. |
| Greenpeace Australia Pacific | Greenpeace Australia Pacific is a non-Government environmental conservation organisation. |
| International Fund for Animal Welfare | International Fund for Animal Welfare is a non-Government environmental conservation organisation. |
| Protect Ningaloo | Protect Ningaloo is a non-Government environmental conservation organisation. |
| Sea Shepherd Australia | Sea Shepherd Australia is a non-Government environmental conservation organisation. |
| Whale and Dolphin Conservation Society | Whale and Dolphin Conservation is a non-Government environmental conservation organisation. |
| Wilderness Society | Wilderness Society is a non-Government environmental conservation organisation. |
| World Wide Fund for Nature | World Wide Fund For Nature is a non-Government environmental conservation organisation. |

| Organisation | Description |
|---|---|
| **First Nations People and Groups** | |
| **Native Title Representative Body** | |
| Kimberley Land Council | Kimberley Land Council is a Western Australia (First Nations) native title representative body for the Kimberley region. |
| Yamatji Marlpa Aboriginal Corporation | Yamatji Marlpa Aboriginal Corporation is a Western Australia (First Nations) native title representative body for the Pilbara region. |
| Northern Land Council | Northern Land Council is an independent statutory Northern Territory authority of the Commonwealth. It is responsible for assisting Aboriginal peoples in the Top End of the Northern Territory to acquire and manage their traditional lands and seas. |
| **Aboriginal Corporation and Representative Body** | |
| Murujuga Aboriginal Corporation | Murujuga Aboriginal Corporation is a Western Australia (First Nations) approved corporate body and representative body. |
| **Registered Native Title Bodies Corporate** | |
| Buurabalayji Thalanyji Aboriginal Corporation | Buurabalayji Thalanyji Aboriginal Corporation is the registered native title body corporate for the Thalanyji People (Pilbara region). |
| Gogolanyngor Aboriginal Corporation | Gogolanyngor Aboriginal Corporation is the registered native title body corporate for the Nimanburr and Jabirr Jabirr/Ngumbarl Peoples (Kimberley region). |
| Karajarri Traditional Lands Association | Karajarri Traditional Lands Association is the Registered Native Title Body Corporate for the Karajarri people (Kimberley region). |
| Kariyarra Aboriginal Corporation | Kariyarra Aboriginal Corporation is the Registered Native Title Body Corporate for the Kariyarra people (Pilbara region). |
| Kunin (Native Title) Aboriginal Corporation | Kunin (Native Title) Aboriginal Corporation is the Registered Native Title Body Corporate for the Rubibi claim group (Kimberley region). |
| Malgana Aboriginal Corporation | Malgana Aboriginal Corporation is the Registered Native Title Body Corporate for the Malgana people (Geraldton region). |
| Nganhurra Thanardi Garrbu Aboriginal Corporation | Nganhurra Thanardi Garrbu Aboriginal Corporation is the Registered Native Title Body Corporate for the Baiyungu, Thalanyji and Yinggarda native title holders (Geraldton region). |
| Ngarluma Aboriginal Corporation | Ngarluma Aboriginal Corporation is the Registered Native Title Body Corporate for the Ngarluma people (Pilbara region). |
| Nyangumarta Karajarri Aboriginal Corporation | Nyangumarta Karajarri Aboriginal Corporation is the Registered Native Title Body Corporate for the Nyangumarta and Karajarri peoples (Pilbara region). The Kimberley Land Council is the nominated contact for this corporation. |
| Nyangumarta Warrarn Aboriginal Corporation | Nyangumarta Warrarn Aboriginal Corporation is the Registered Native Title Body Corporate for the Nyangumarta people (Pilbara region). |
| Wanparta Aboriginal Corporation | Wanparta Aboriginal Corporation is the Registered Native Title Body Corporate for the Ngarla people (Pilbara region). |
| Wirrawandi Aboriginal Corporation | Wirrawandi Aboriginal Corporation is the Registered Native Title Body Corporate for the Mardudhunera and Yaburara people (Pilbara region). |
| Yawuru Native Title Holders Aboriginal Corporation | Yawuru Native Title Holders Aboriginal Corporation is the Registered Native Title Body Corporate for the Yawuru people (Kimberley region). |
| Yinggarda Aboriginal Corporation | Yinggarda Aboriginal Corporation is the Registered Native Title Body Corporate for the Yinggarda people (Geraldton region). |
| **Lodged/Registered Native Title claim organisations** | |
| Nhuwala Claim Group | Nhuwala Claim Group hold a Western Australia (First Nations) registered native title claim in the Pilbara region of Western Australia. |
| Thalanyji/Nhuwala People | Thalanyji Nhuwala Peoples hold a Western Australia (First Nations) registered native title claim in the Pilbara region of Western Australia. |

| Organisation | Description |
|---|---|
| **Industry Associations** | |
| **Industry Associations – Commercial Fishing** | |
| Aquaculture Council of Western Australia | Aquaculture Council of Western Australia is a commercial fishing industry association and representative body. |
| Australian Southern Bluefin Tuna Industry Association | Australian Southern Bluefin Tuna Industry Association is a commercial fishing industry association and representative body. |
| Commonwealth Fisheries Association | Commonwealth Fisheries Association is a commercial fishing industry association and representative body. |
| Pearl Producers Association | Pearl Producers Association is a commercial fishing industry association and representative body. |
| Tuna Australia | Tuna Australia-Western Tuna and Billfish Fishery is a commercial fishing industry association and representative body. |
| Western Australian Fishing Industry Council | Western Australian Fishing Industry Council is a commercial fishing industry association and representative body. |
| Western Rock Lobster Council | The Western Rock Lobster Council is a commercial fishing industry association and representative body. |
| **Industry Associations – Energy Industry** | |
| Australian Energy Producers | Australian Energy Producers is an energy industry association. |
| **Industry Associations – Local Government** | |
| WA Local Government Association | WA Local Government Association is an association representing the Western Australia local government sector. |
| **Industry Associations – Local Industry** | |
| Carnarvon Chamber of Commerce and Industry | The Carnarvon Chamber of Commerce and Industry is an independent Local industry association supporting businesses in Carnarvon and surrounding areas. |
| Exmouth Chamber of Commerce and Industry | The Exmouth Chamber of Commerce and Industry is an independent Local industry association supporting businesses in Exmouth and surrounding areas. |
| Karratha & Districts Chamber of Commerce and Industry | The Karratha and Districts Chamber of Commerce and Industry is an independent Local industry association supporting businesses in Karratha and surrounding areas. |
| Onslow Chamber of Commerce and Industry | The Onslow Chamber of Commerce and Industry is an independent Local industry association supporting businesses in Onslow and surrounding areas. |
| Port Hedland Chamber of Commerce & Industry | The Port Hedland Chamber of Commerce and Industry is an independent Local industry association supporting businesses in Port Hedland and surrounding areas. |
| Port Hedland Industries Council | The Port Hedland Industries Council is an independent Local industry association that helps industry partners share knowledge and manage their community impacts in Port Hedland and surrounding areas. |
| **Industry Associations – Recreational Fishing** | |
| Recfishwest | Recfishwest is a recreational fishing association. |
| Western Australian Game Fishing Association | The Western Australian Game Fishing Association is a recreational fishing association coordinating game fishing activities across Western Australia. |
| **Industry Associations – Shipping** | |
| Maritime Industry Australia Ltd | Maritime Industry Australia Ltd is a Commercial shipping industry association. |
| **Industry Associations – Tourism** | |
| Australian Tourism Industry Council | The Australian Tourism Industry Council is a Tourism industry association. |
| Marine Tourism Western Australia | Marine Tourism Western Australia is a Tourism industry association. |
| Tourism Council of Western Australia | Tourism Council of Western Australia is a Tourism industry association. |

| Organisation | Description |
|---|---|
| Western Australian Indigenous Tourism Operators Council | Western Australian Indigenous Tourism Operators Council is a Tourism industry association. |
| **Infrastructure Organisations** | |
| Telstra | Telstra is a Telecommunications infrastructure organisation. |
| Vocus Group Ltd | Vocus Group Ltd is a Telecommunications infrastructure organisation. |
| **Local Government Authority** | |
| City of Karratha | The City of Karratha is a Western Australia local government authority. |
| Shire of Ashburton | The Shire of Ashburton (Onslow) is a Western Australia local government authority. |
| Shire of Carnarvon | The Shire of Carnarvon is a Western Australia local government authority. |
| Shire of East Pilbara | The Shire of East Pilbara is a Western Australia local government authority. . |
| Shire of Exmouth | The Shire of Exmouth is a Western Australia local government authority. |
| Shire of Shark Bay | The Shire of Shark Bay is a Western Australia local government authority. |
| Town of Port Hedland | The Town of Port Hedland is a Western Australia local government authority. |
| **Recreation and Community Organisations** | |
| Ashburton Anglers Incorporated | Ashburton Anglers Incorporated is a recreation and community association. |
| Carnarvon Fishing Club Incorporated | Carnarvon Fishing Club Incorporated is a recreation and community association. |
| Exmouth Community Liaison Group | The Exmouth Community Liaison Group is a recreation and community association representing the interests of local government, industry, and community interests on energy-related issues in the Exmouth region. |
| Exmouth Community Liaison Group | The Exmouth Community Liaison Group is a recreation and community association representing the interests of local government, industry, and community interests on energy-related issues in the Exmouth region. |
| Exmouth Game Fishing Club Inc | Exmouth Game Fishing Club Inc is a recreation and community association. |
| King Bay Game Fishing Club Inc | King Bay Game Fishing Club Inc is a recreation and community association. |
| Nickol Bay Sportfishing Club Inc | Nickol Bay Sportfishing Club Inc is a recreation and community association. |
| Port Hedland Game Fishing Club Inc | Port Hedland Game Fishing Club Inc is a recreation and community association. |
| **Research Organisations** | |
| Centre for Whale Research | Centre for Whale Research is focused on ocean health, namely monitoring and protecting the population health of the great whales. |
| Commonwealth Scientific and Industrial Research Organisation | The Commonwealth Scientific and Industrial Research Organisation is Australia's national science agency. |
| Minderoo Foundation Exmouth Research Lab | Minderoo Foundation Exmouth Research Lab is a research organisation. |
| The Pew Charitable Trusts | The Pew Charitable Trusts is a research organisation. |
| The Shark Ark Project | The Shark Ark Project is a research organisation. |
| Shark Bay Dolphin Project | Shark Bay Dolphin Project is a research organisation. |
| Western Australian Marine Science Institution | The Western Australian Marine Science Institution is a leading independent research organisation delivering large-scale, long-term marine studies on WA's marine estate through collaboration with government, industry, and academia. |
| **Tourism Organisations (Marine and/or Coastal)** | |
| All the Gear No Idea Sportfishing | All the Gear No Idea Sportfishing is a marine and/or coastal tourism organisation. |
| Apache Charters | Apache Charters is a marine and/or coastal tourism organisation. |
| Aqualand Charters | Aqualand Charters is a marine and/or coastal tourism organisation. |
| Archipelago Adventures | Archipelago Adventures is a marine and/or coastal tourism organisation. |
| Baiyungu Dreaming | Baiyungu Dreaming is a marine and/or coastal tourism organisation. |

| Organisation | Description |
|---|---|
| Blue Horizon Charters | Blue Horizon Charters is a marine and/or coastal tourism organisation. |
| Blue Juice Charters | Blue Juice Charters is a marine and/or coastal tourism organisation. |
| Coral Bay Ecotours | Coral Bay Ecotours is a marine and/or coastal tourism organisation. |
| Coral Coast Tours | Coral Coast Tours is a marine and/or coastal tourism organisation. |
| Dampier Archipelago and Murujuga Sea Kayak Expedition | Dampier Archipelago and Murujuga Sea Kayak Expedition is a marine and/or coastal tourism organisation. |
| Dive Charter Onslow | Dive charter Onslow are a marine/costal operator connected to sea and/or land-based activities (i.e. cultural tours, fishing charters, diving, accommodation etc.) |
| Dive Ningaloo | Dive Ningaloo is a marine and/or coastal tourism organisation. |
| Eighty Mile Beach Caravan Park, WA | Eighty Mile Beach Caravan Park, WA is a marine and/or coastal tourism organisation. |
| Evolution Charters Exmouth | Evolution Charters Exmouth is a marine and/or coastal tourism organisation. |
| Exmouth Adventure Co | Exmouth Adventure Co is a marine and/or coastal tourism organisation. |
| Exmouth Dive & Whalesharks Ningaloo | Exmouth Dive & Whalesharks Ningaloo is a marine and/or coastal tourism organisation. |
| Exmouth Fishing Adventures | Exmouth Fishing Adventures is a marine and/or coastal tourism organisation. |
| Gt Diving A | Gt Diving A is a marine and/or coastal tourism organisation. |
| Innkeeper Sport Fishing Charter | Innkeeper Sport Fishing Charter is a marine and/or coastal tourism organisation. |
| Karratha Adventure Sports | Karratha Adventure Sports is a marine and/or coastal tourism organisation. |
| Kings Ningaloo Reef Tours | Kings Ningaloo Reef Tours is a marine and/or coastal tourism organisation. |
| Lethal Adventures | Lethal Adventures is a marine and/or coastal tourism organisation. |
| Live Ningaloo | Live Ningaloo is a marine and/or coastal tourism organisation. |
| Maccy Dave's Kayak Fishing Adventures | Maccy Dave's Kayak Fishing Adventures is a marine and/or coastal tourism organisation. |
| Mackerel Islands Pty Ltd | Mackerel Islands Pty Ltd is a marine and/or coastal tourism organisation. |
| Mahi Mahi Fishing Charters | Mahi Mahi Fishing Charters is a marine and/or coastal tourism organisation. |
| Montebello Island Safaris | Montebello Island Safaris is a marine and/or coastal tourism organisation. |
| Murujuga Rock Art & Cultural Tours Pilbara WA | Murujuga Rock Art & Cultural Tours Pilbara WA is a marine and/or coastal tourism organisation.<br>This tourism organisation is part of Murujuga Aboriginal Corporation. |
| Ngurrangga Tours | Ngurrangga Tours is a marine and/or coastal tourism organisation. |
| Ningaloo Car & Boat Hire | Ningaloo Car & Boat Hire is a marine and/or coastal tourism organisation. |
| Ningaloo Coral Bay Boats | Ningaloo Coral Bay Boats is a marine and/or coastal tourism organisation. |
| Ningaloo Marine Interactions | Ningaloo Marine Interactions is a marine and/or coastal tourism organisation. |
| Ningaloo Reef Dive | Ningaloo Reef Dive is a marine and/or coastal tourism organisation. |
| Ningaloo Safari Tours | Ningaloo Safari Tours is a marine and/or coastal tourism organisation. |
| Ningaloo Sportfishing Charters | Ningaloo Sportfishing Charters is a marine and/or coastal tourism organisation. |
| Ningaloo Whale Shark N Dive | Ningaloo Whale Shark N Dive is a marine and/or coastal tourism organisation. |
| Ningaloo Whale Sharks Exmouth | Whale Sharks Exmouth are a marine/costal operator connected to sea and/or land-based activities (i.e. cultural tours, fishing charters, diving, accommodation etc.) |
| Oceanus Sport Fishing Charters | Oceanus Sport Fishing Charters is a marine and/or coastal tourism organisation. |
| On Point Spearfishing | On Point Spearfishing is a marine and/or coastal tourism organisation. |
| On Strike Charters | On Strike Charters is a marine and/or coastal tourism organisation. |
| Onslow Beach Resort | Onslow Beach Resort is a marine and/or coastal tourism organisation. |

| Organisation | Description |
|---|---|
| Pardoo Tourist Park Pardoo Station | Pardoo Tourist Park Pardoo Station are a marine/costal operator connected to sea and/or land-based activities (i.e. cultural tours, fishing charters, diving, accommodation etc.) |
| Peak Sportfishing Charters | Peak Sportfishing Charters is a marine and/or coastal tourism organisation. |
| Pelican Charters | Pelican Charters is a marine and/or coastal tourism organisation. |
| Pilbara Dive and Tours | Pilbara Dive and Tours is a marine and/or coastal tourism organisation. |
| Pilbara Sea Charters | Pilbara Sea Charters is a marine and/or coastal tourism organisation. |
| Pilbara Tours | Pilbara Tours is a marine and/or coastal tourism organisation. |
| Reef Seeker Charters | Reef Seeker Charters is a marine and/or coastal tourism organisation. |
| Reel Teaser Fishing Adventures | Reel Teaser Fishing Adventures is a marine and/or coastal tourism organisation. |
| Sail Ningaloo | Sail Ningaloo is a marine and/or coastal tourism organisation. |
| Sal Salis | Sal Salis is a marine and/or coastal tourism organisation. |
| Seastar Boat Charters | Seastar Boat Charters is a marine and/or coastal tourism organisation. |
| Seaforce Fishing Charters | Seaforce Fishing Charters is a marine and/or coastal tourism organisation. |
| Shark Bay Charters | Shark Bay Charters is a marine and/or coastal tourism organisation. |
| Shark Bay Coastal Tours | Shark Bay Coastal Tours is a marine and/or coastal tourism organisation. |
| Shark Bay Eco Tours | Shark Bay Eco Tours is a marine and/or coastal tourism organisation. |
| Top Gun Charters | Top Gun Charters is a marine and/or coastal tourism organisation. |
| View Ningaloo | View Ningaloo is a marine and/or coastal tourism organisation. |
| WA Fishing Charters | WA Fishing Charters is a marine and/or coastal tourism organisation. |
| Whale Shark Tours Exmouth | Whale Shark Tours Exmouth are a marine/coastal operator connected to sea and/or land-based activities (i.e. cultural tours, fishing charters, diving, accommodation etc.) |

### 4.5.3 Consultation

In developing this EP Santos made itself available to work with relevant persons on pragmatic and practical approaches to consultation that aligned with regulatory requirements.

A key aspect of these approaches recognised, based on publicly available information and where Santos had first-hand knowledge through previous consultation and engagement activities, that the interests or activities of relevant persons identified for consultation may be affected either by:

- Impacts from planned activities and risks from unplanned events given their proximity to proposed activities; or
- Risks from unplanned events only given their significant distance from proposed activities.

As a result, Santos developed consultation email types to reflect the above assessments.

Santos has also developed a third consultation email type for persons and organisations identified for consultation in circumstances where the potential for the proposed activities to affect the functions, interests or activities of the person or organisation was unclear. Those to whom Santos sent this third consultation email type were given the opportunity to tell Santos if they wished to be consulted for the purposes of section 25(1) of the OPGGS(E)R.

These consultation approaches ensured that email recipients were clear about why Santos was contacting them. Examples of these email types are included in Appendix F.

Santos proceeded to consult with a number of persons who had been identified through the above processes as potential Relevant Persons, with a view to ascertaining during consultation sessions what, if any, functions, interests or activities they had that may be affected by the activities proposed in this EP. Those to whom Santos sent the third consultation email type, but did not respond to the opportunity provided them to self-identify for consultation under section 25(1) of the OPGGS(E)R, were still included in subsequent consultation processes, including being invited to provide input for the EP. Santos has taken a broad approach and considers that these people or organisations are Relevant Persons for the purposes of consultation on this EP (and therefore they have been included in Table 4-6 and Table 4-7) notwithstanding that in some cases, no potentially affected functions, interests or activities were ultimately ascertained.

It should also be noted that the likelihood of relevant persons along the WA coastline, having a function, interests or activity that may be affected by an unplanned spill event, becomes increasingly unlikely with increasing distance from the operational area.

While Santos has included in its consultation, relevant persons whose functions, interests or activities may only be affected by an unplanned spill event and has implemented its public awareness campaign in the EMBA (see Table 4-4 (thereby providing consultation opportunities for authorities, persons and organisations in regions many hundreds of kilometres from the proposed activities), Santos has focused its consultation effort (including use of alternative communications channels) more closely on those relevant persons whose potentially affected functions, interests and activities are most proximate to the OA where activity impacts typically occur. The latter includes, for example, commercial fishers and other marine users, as well as organisations representing the interests of First Nations people, local communities and business, which are more proximate to the OA.

Also, in the event of a hydrocarbon spill, organisations will be notified as outlined in Table 8-4 and Table 8-6.

All of the above efforts are reflected in the Consultation Report (consultation summary) in Appendix F.

Santos also considered consultation preferences of respective relevant persons, which have been previously communicated to Santos through:

- prior consultation in the WA including the Bedout region
- ongoing community engagement with key WA stakeholders
- published preferences of certain organisations.

Santos' consultation materials also encourages relevant persons to tell Santos how they would like to be consulted and any additional information they need.

By way of example, Santos took the following steps for each of the following groups:

**All authorities, persons and organisations**

- Provided information using different mediums and platforms, including by telephone, email, website, electronic materials and/or in person and/or virtual meetings.
- Made information available about proposed activities to be managed under this EP on the Santos website at www.santos.com/offshoreconsultation. Hyperlinks to this website were included in consultation emails, print adverts and social media adverts.

**Commonwealth fisheries**

- Recognised previous feedback from the Australian Fisheries Management Authority to contact to relevant industry bodies where the interests or activities of commercial fishers may be affected.
- Using a fee-for-service arrangement with Tuna Australia to obtain activity specific reports on behalf of licence holders where the interests or activities of licence holders in this fishery may be affected.

**Western Australian fisheries**

- Recognised previous advice from the WA Department of Primary Industries and Regional Development that Santos should initiate and maintain ongoing consultation with peak fishing sector bodies in WA to ensure fishers are consulted prior to proposed activities.
- Recognised WAFIC's published guidance that petroleum titleholders consult directly with those Western Australian fishery licence holders that have been historically active in Operational Areas, while maintaining a list of all fisheries that spatially overlap the EMBA. This approach acknowledges previous feedback from WAFIC regarding consultation fatigue among Western Australia's estimated 1,500 fishing boat licence holders.
- Using a fee-for-service arrangement with WAFIC to circulate Santos' consultation information via email to licence holders and encouraging licence holders to provide feedback.

**Recreational fisheries**

- Recognised previous advice from Recfishwest for it to be the focal point for consultation activities, while also ensuring fishing clubs proximate to proposed activities are consulted. This approach acknowledges DPIRD's published estimate that there are 620,000 recreational fishers in Western Australia.

It should be noted that Santos maintains a list of all fisheries that overlap the EMBA to support emergency communications via government authorities and representative organisations in the event that a spill from an unplanned event has the potential to impact the fishery and the day-to-day activities of fishers.

A summary of consultation activities is outlined in Table 4-8.

**Table 4-8: Summary of consultation activities**

| Activity | Purpose | Timing |
|---|---|---|
| **Consultation email – general**<br>Email to identified authorities, persons and organisations with general fact sheet. | Notify Santos-identified relevant persons of the commencement and closing dates for consultation, provision of sufficient information to allow an informed assessment of the potential consequences of the proposed Activity, if any, for them. | From 23 July 2025 |
| **Consultation email – fishers**<br>Email to identified commercial fishing authorities and organisations with general fact sheet and commercial fisher fact sheet. | Notify Santos-identified relevant persons of the commencement and closing dates for consultation, provision of sufficient information to allow an informed assessment of the potential consequences of the proposed Activity, if any, for them. | From 23 July 2025 |
| **Consultation Hub website**<br>Website content and activity fact sheets developed and made available at https://www.santos.com/offshoreconsultation/carnarvon/ | Provision of information as described in Section 4.5.2.7. | From 23 July 2025 |
| **Social media campaign**<br>Facebook, Instagram and Messenger geotargeted PPL18+ Carnarvon, Exmouth, Onslow, Karratha, Port Hedland, Broome | Promote awareness of proposed activities to create opportunities for relevant persons to self-identify and provide feedback. | From 31 July 2025 |
| **Radio advertising campaign**<br>Advertisements on these radio stations:<br>• Karratha HIT 106.5<br>• WA Remote HIT WA FM<br>• MMM<br>• Broome HIT 101.3<br>• Pilbara and Kimberley Aboriginal Media Radio | Promote awareness of proposed activities to create opportunities for relevant persons to self-identify and provide feedback. | From 27 July 2025 |
| **Print advertising campaign**<br>Advertisements in these publications:<br>• The West Australian<br>• North West Telegraph<br>• Pilbara News Guardian<br>• Broome Advertiser | Promote awareness of proposed activities to create opportunities for relevant persons to self-identify and provide feedback. | From 23 July 2025 |
| **Consultation reminder email – general**<br>Reminder email to all identified potential authorities, persons and organisations with general fact sheet. | Notify Santos-identified relevant persons of the closing date for consultation. | From 14 August 2025 |
| **Reminder phone calls**<br>Reminder phone calls to targeted authorities. persons and organisations. | Notify Santos-identified relevant persons one week prior to the closing date for consultation. | From 15 August 2025 |

#### 4.5.3.1 Consultation materials

Santos provided authorities, persons and organisations with sufficient information so they could make an informed assessment about the possible consequences of the proposed activity on their functions, interests or activities.

Santos provided authorities, persons and organisations with information regarding:

- The Activity proposed under this EP, including its proposed timing and duration
- The environment that may be affected by the proposed Activity, including depictions of the modelled EMBA and explaining how the EMBA was determined
- The potential environmental impacts and risks of the proposed Activity and proposed control measures
- The environmental approval process
- The purpose of consultation, who may be a relevant authority, person or organisation and how to self-nominate as such

- The titleholder's obligations during consultation in the course of preparing an environment plan, including informing relevant persons that they can request that particular information they provide during consultation not be published and that information subject to such a request will not be published under the relevant regulations (and will instead be included in a separate report which will not be published on NOPSEMA's website)
- The obligation of the titleholder not to publish particular information if so requested by the authority, person or organisation that provided the information
- How to provide feedback, including contact details for the person responsible for coordinating the consultation
- A link to NOPSEMA's information sheet 'Consultation on offshore petroleum environment plans.'

At a minimum, this information was made available on the Santos website and also included in the fact sheets which Santos sent to authorities, persons and organisations by email, and made available during consultation sessions (where applicable).

Authorities, persons and organisations were alerted to and / or provided access to information in different formats and different levels of detail, including in emails, a general fact sheet, a commercial fisher fact sheet, online and print advertisements, radio advertisements, social media posts, phone calls, in-person/online consultation meetings and on the Santos Consultation Hub website.

Santos' Privacy Statement was also made available at in-person for meetings with First Nations people and groups and referenced during online meetings. A link was provided in consultation campaign emails to the Santos' WA and NT Privacy Policy, which is published on the Santos Consultation Hub website.

Examples of the consultation materials used are included in Appendix F.

### 4.5.4 Environment Plan development

In developing this EP, Santos has:

- Provided, in accordance with section 24(b) of the OPGGS(E)R, a Consultation Report on all consultations under section 25 of the OPGGS(E)R (see Appendix F), which includes a consultation summary (including a summary of each response made by a relevant person), an assessment of the merits of any objection or claim about the adverse impact of the proposed Activity, Santos' response, or proposed response, if any, to each objection or claim and, where applicable, a reference to relevant sections of the EP, including where relevant control measures are described. A collation of the full text of any responses by relevant persons has also been prepared for the purpose of section 24(b)(iv) and is included in the sensitive information part of the EP, in accordance with s 26(8) of the OPGGS(E)R.
- Updated this EP to reflect any feedback that informs:
  - Changes to the Activity Description in Section 2.
  - The existing environment in Section 3.
  - Evaluation of environmental impacts of the Activity and associated management measures in Sections 6 and 8.
  - Evaluation of environmental risks of the Activity and associated management measures in Sections 7 and 8.
  - Santos' implementation strategy, including insofar as it provides for appropriate consultation with relevant authorities, and other relevant interested persons or organisations over the life of the EP. Refer implementation strategy, Section 8.
  - The implementation strategy in Section 8 includes activity notifications requested by authorities, persons and organisations during consultation or where Santos has standing activity notifications, if required, prior to, during or upon completion of activities. See Table 8-4 and Table 8-6. Santos carries out ongoing consultation during the life of an EP, including after an EP has been accepted by the Regulator.

Santos' post EP acceptance consultation implementation strategy is described in Section 8.12 and Activity notifications, if required, are outlined in Table 8-4 and Table 8-6.

If, during the course of post acceptance consultation, Santos receives information demonstrating a new or increased environmental impact or risk that is not provided for in this EP, (as in force at the time) Santos will apply its Management of Change process outlined in Section 8.10.2.

# 5. Environmental Impact and Risk Assessment

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 21. Environmental Assessment** |
| Evaluation of environmental impacts and risks<br>21(5) The environment plan must include:<br>a) details of the environmental impacts and risks for the activity; and<br>b) an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk; and<br>c) details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level.<br>21(6) To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all the environmental impacts and risks arising directly or indirectly from:<br>a) all operations of the activity; and<br>b) potential emergency conditions, whether resulting from accident or any other reason. |

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

Santos has undertaken environmental impact and risk assessments for the planned events (including any routine, non-routine, and contingency activities) and unplanned events in accordance with the OPGGS(E)R 2023.

Provided in this section of the EP is the following information relating to the environmental impact and risk assessment approach:

- terminology used
- summary of the approach.

The process used to identify, analyse and evaluate environmental impacts and risks is fully described in Santos' Offshore Division Environmental Hazard Identification and Assessment Guideline.

## 5.1 Impact and Risk Assessment Terminology

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

**Table 5-1: Impact and Risk Assessment Terms**

| Name | Definition |
|---|---|
| Acceptability | Determined for both impacts and risks. Acceptability of events is in part determined by the consequence of the impact following management controls. Acceptability of unplanned events is in part determined from its risk ranking following management controls. For both impacts and risks, acceptability is also determined from a demonstration of the ALARP principle, consistency with Santos Policies, consistency with all applicable legislation and consideration of relevant stakeholder consultation when determining management controls. |
| Activity | Specific tasks and actions undertaken throughout the lifecycle of oil and gas exploration, production, and decommissioning. |
| ALARP | As Low as Reasonably Practicable.<br>The term refers to reducing risk to a level that is As Low as Reasonably Practicable. In practice, this means showing through reasoned and supported arguments, that there are no other practicable options that could reasonably be adopted to reduce risks further. |
| Authorised Person | Person with authority to make the decision or take the action. Examples are Vessel Master, Field Superintendent, Supervisor, Person-in-Charge, Company Authorised Representative, and Project Manager. |
| Control Measure | Means a system, an item of equipment, a person, or a procedure, that is used as a basis for managing environmental impacts and risks. |
| Environment | Includes the natural and socio-economic values and sensitivities which will or may be affected by the activity. |

| Name | Definition |
|---|---|
| | Is defined by NOPSEMA and DMPE as:<br>(a) ecosystems and their constituent parts, including people and communities<br>(b) natural and physical resources<br>(c) the qualities and characteristics of locations, places, and areas<br>(d) the heritage value of places<br>(e) the social, economic, and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d). |
| Environmental Consequence | A consequence is the outcome of an event affecting objectives.<br>Note 1: An event can be one or more occurrences and can have several cases.<br>Note 2: An event can consist of something not happening.<br>(Reference ISO 73:2009 Risk Vocabulary). |
| Environmental Impact | Defined by the NOPSEMA to mean any change to the environment, whether adverse or beneficial, that wholly or partially results from the activity.<br>Defined by DMPE as any change to the environment, whether adverse or beneficial, that wholly or partly results from an activity of an operator. |
| ENVID | Environmental hazard identification workshop. |
| Environmental Risk | Applies to unplanned events. Risk is a function of the likelihood of the unplanned event occurring and the consequence of the environmental impact that arises from that event. |
| Hazard | A situation with the potential to cause harm. |
| Grossly Disproportionate | Where the sacrifice (cost and effort) of implementing a control measure to reduce impact or risk grossly exceeds the environmental benefit to be gained. |
| Impact Assessment | The process of determining the consequence of an impact (in terms of the consequence to the environment) arising from a planned or unplanned event over a specified period of time. |
| Likelihood | The chance of an unplanned event occurring. |
| Non-routine Planned Event | An attribute of the planned activity that may occur or will occur infrequently during the planned activity. A non-routine planned event is intended to occur at the time. |
| Planned Activity | A description of the activity to be undertaken, including the services, equipment, products, assets, personnel, timing, duration and location and aspect of the activity. |
| Planned Event | An event arising from the activity which is done with intent (i.e. not an unplanned event) and has some level of environmental impact. A planned event could be routine (expected to occur consistently throughout the activity) or non-routine (may occur infrequently if at all). Air emissions, bilge water discharge and drill cuttings discharge would be examples of planned events. |
| Receptor | A feature of the environment that may have environmental, social and/or economic values. |
| Risk | The effect of uncertainty on objectives. |
| Risk Assessment | The process of determining the likelihood of an unplanned event and the consequence of the impact (in terms of economic, human safety and health, or ecological effects) arising from the event over a specified period of time. |
| Routine Planned Event | An attribute of the planned activity that results in some level of environmental impact and will occur continuously or frequently through the duration of the planned activity. |
| Unplanned Event | An event that results in some level of environmental impact and may occur despite preventive safeguards and control measures being in place. An unplanned event is not intended to occur during the activity. |

## 5.2 Summary of the Environmental Impact and Risk Assessment Approach

### 5.2.1 Overview

Santos operates under an overarching Risk Management Policy. The company Risk Management and Assurance Operating standard underpins the Risk Management Policy and is consistent with the requirements of *AS/NZS ISO 31000:2018, Risk Management – Guidelines.*

The key steps to risk management are illustrated in Figure 5-1. The forum used to undertake the assessment is the environmental hazard workshop, referred to as an ENVID, which is described in Section 4 of *Santos' Offshore Division Environmental Hazard Identification and Assessment Guideline*.

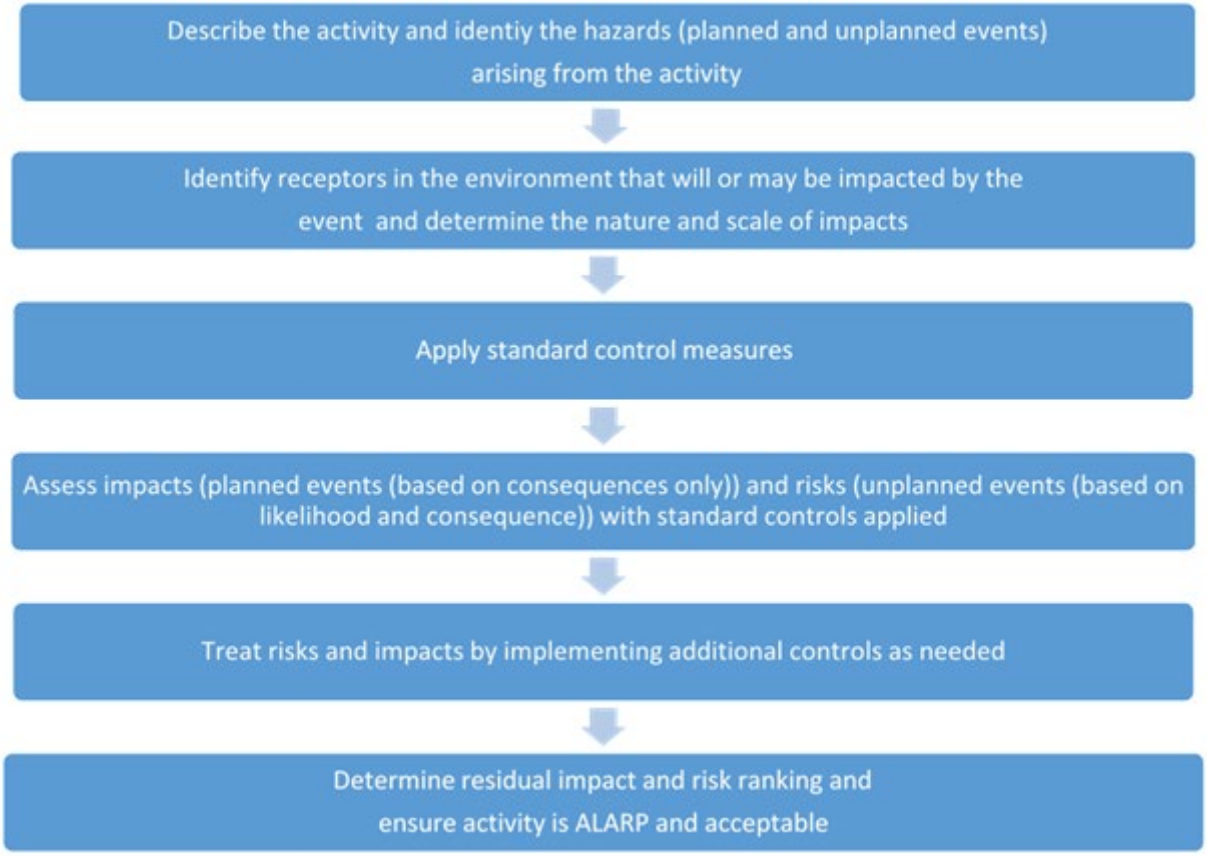



**Figure 5-1: Hazard identification and Assessment Guideline**

### 5.2.2 Context Setting

*Santos' Offshore Division Environmental Hazard Identification and Assessment Guideline*) includes consideration of the following key areas in an impact and risk assessment:

- description of the activity (including location and timing)
- description of the environment (potentially affected by both planned activities and unplanned events)
- identification of relevant persons
- identification of legal requirements ('legislative controls') that apply to the activity
- Santos' policy and SMS requirements
- principles of Ecologically Sustainable Development (ESD)
- Santos acceptable levels of impact and risk.

These factors were considered during the environmental hazards identification (ENVID) workshop held on 12 and 17 September 2024 for planned and unplanned events respectively. An additional ENVID refresher workshop was held on 1 May 2025 to ensure that the information was still current. The workshop involved participants from Santos' project team, spill response department, and specialist environmental consultants.

### 5.2.3 Describe the Activities and Hazards (planned and unplanned events)

A description of the activity is required in order to determine the planned events that will take place and the credible unplanned events that may occur. The location, timing and scope of the activity must be described in order to determine the impacts from planned events, and the impacts and risks from unplanned events since these have a bearing upon the EMBA by the activity.

The outcome of this assessment is detailed in the relevant sub-sections of Sections 6 and 7.

### 5.2.4 Identify Receptors and Determine Nature and Scale of Impacts

To determine the magnitude of effects from both planned and unplanned events, assessments are conducted using modelling and scientific reports, such as for hydrocarbon spills. A description of the environment (natural and socio-economic) within which hazards from the activity will, or may occur, is required (Section 3). It is crucial to understand the natural and socio-economic environment in which hazards may arise from the activity. This

understanding is necessary to evaluate the type and consequences of impacts resulting from the activity. The environment must be examined in terms of the spatial and temporal boundaries of the activity in order to identify key resources that may be at risk from planned and unplanned events. Santos has developed a *Values and Sensitivities of the Western Australian Marine Environment* (EA-00-RI-10062) (Appendix C), a reference document that provides information about the existing environment that maybe affected by Santos' activities and is reviewed and updated annually.

When evaluating the existing environment for regulatory approvals, a comparison is made with *Santos' Values and Sensitivities of the Western Australian Marine Environment* document. Additionally, a new protected matters search is carried out to ensure comprehensive understanding of the existing environment, in order to assess all risks (*Bedout Basin Exploration and Appraisal Drilling Values and Sensitivities of the Marine and Coastal Environment* – Appendix C).

The extent of actual impacts resulting from planned activities, as well as the risks associated with unplanned activities, are assessed using modelling and scientific reports, such as for hydrocarbon spills. The duration of each event is also described, including the potential duration of any impacts that may occur. Section 3 and Appendix C provide detailed information about receptors that may be located within the affected area(s).

## 5.3 Describe the Environmental Performance Outcomes and Control Measures

For each planned and unplanned event, a set of Environmental Performance Outcome(s), Control Measures, Environmental Performance Standards and Measurement Criteria are identified. The definitions of the performance outcomes, control measures, standards and measurement criteria must be consistent with the OPGGS(E)R 2023, and the NOPSEMA *Environment Plan Content Requirement Guidance Note* (NOPSEMA, 2025d).

Additional controls must also be considered and either accepted for use or not adopted based on whether the standard controls reduce impacts and risks to levels that are ALARP and acceptable (refer Sections 5.6 and 5.7).

Controls are allocated in order of preference according to the hierarchy of controls as shown in Figure 5-2

| Control | Effectiveness | Example |
|---|---|---|
| **Eliminate** | | *Removal of the risk.*<br>Refueling of vessels at port eliminates the risks of an offshore refueling. |
| **Substitute** | | *Change the risk for a lower one.*<br>The use of low-toxicity chemicals that perform the same task as a more toxic additive. |
| **Engineering** | | *Engineer out the risk.*<br>The use of oil-in-water separator to minimise the volume of oil discharged. |
| **Isolation** | | *Isolate people or the environment from the risk.*<br>The use of bunding for containment of bulk liquid materials. |
| **Administrative** | | *Provide instructions or training to people to lower the risk.*<br>The use of Job Hazard Analysis to assess and minimise the environmental risks of an activity. |
| **Protective** | | *Use of protective equipment.*<br>Containment and recovery of spilt hydrocarbons. |

**Figure 5-2: Hierarchy of Controls**

## 5.4 Determine the Impact Consequence Level and Risk Rankings (on the basis that all control measures have been implemented)

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

The consequence level of the impact is then determined for each planned and unplanned event using the Santos *Offshore Division Environmental Hazard Identification and Assessment Guideline – Environmental Consequence Descriptors* (Appendix G).

These detailed environmental consequence descriptions are based on the consequence of the impact to relevant receptors in the following categories:

- threatened/migratory/local fauna
- physical environment/habitat
- threatened ecological communities
- protected areas
- socio-economic receptors, including cultural features.

This process determines a consequence level, based on set criteria for each receptor category, and takes into consideration the duration and extent of the impact, receptor recovery time and the effect of the impact at a population, ecosystem, or industry level. Refer to Section 5.5 for determining consequence levels relating to First Nations cultural features.

For unplanned events, a risk ranking is also determined using an assessment of the likelihood (likelihood ranking) of the event as well as the consequence level of the potential impact should that event occur. Likelihood rankings are provided in the Santos risk in Table 5-3.

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

As planned events are expected to occur during the activity, the likelihood of their occurrence is not considered during the risk assessment, and only a consequence level is assigned (Table 5-2).

**Table 5-2: Summary Environmental Consequence Descriptors**

| Consequence Level | Consequence Level Description |
|---|---|
| I | **Negligible**- No impact or negligible impact |
| II | **Minor**- Detectable but insignificant change to local population, industry, or ecosystem factors |
| III | **Moderate**- Significant impact to local population, industry, or ecosystem factors |
| IV | **Major**- Major long-term effect on local population, industry, or ecosystem factors |
| V | **Severe**- Complete loss of local population, industry, or ecosystem factors AND/OR extensive regional impacts with slow recovery |
| VI | **Critical-** Irreversible impact to regional population, industry, or ecosystem factors |

For unplanned events, the consequence level of the impact is combined with the likelihood of the impact occurring (Table 5-3), to determine a residual risk ranking using the corporate Santos risk matrix (Table 5-4). For oil spill events, potential impacts to environmental receptors are assessed where they occur within the EMBA using results from modelling.

**Table 5-3: Likelihood Description**

| No. | Matrix | Description |
|---|---|---|
| f | Almost Certain | Occurs in almost all circumstances OR could occur within days to weeks |
| e | Likely | Occurs in most circumstances OR could occur within weeks to months |
| d | Occasional | Has occurred before in Santos OR could occur within months to years |

| No. | Matrix | Description |
|---|---|---|
| c | Possible | Has occurred before in the industry OR could occur within the next few years |
| b | Unlikely | Has occurred elsewhere OR could occur within decades |
| a | Remote | Requires exceptional circumstances and is unlikely even in the long term |

**Table 5-4: Santos Risk Matrix**

| | | Consequence | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI |
| Likelihood | F | Low | Medium | High | Very High | Very High | Very High |
| | E | Low | Medium | High | High | Very High | Very High |
| | D | Low | Low | Medium | High | High | Very High |
| | C | Very Low | Low | Low | Medium | High | Very High |
| | B | Very Low | Very Low | Low | Low | Medium | High |
| | A | Very Low | Very Low | Very Low | Low | Medium | Medium |

## 5.5 Cultural Features Assessment

The definition of 'environment' under the OPGGS(E)R 2023 is broad, and means:

a) ecosystems and their constituent parts, including people and communities; and

b) natural and physical resources; and

c) the qualities and characteristics of locations, places, and areas; and

d) the heritage value of places.

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

When assessing the consequence level of impact to cultural features, Santos considers the different types of cultural features and types of impacts. For impacts to cultural features, in the form of impacts to marine species that are either a cultural food source or are considered culturally significant to First Nations people, Santos assesses impacts with reference to the consequence assessment for threatened/migratory/local fauna.

Similarly, where cultural features are linked to a specific place, impacts to cultural features are assessed with reference to the consequence assessment for physical environment/threatened ecological communities/protected areas as applicable.

Where there are concerns raised about cultural and spiritual beliefs that do not link to a specific place (or physical/tangible feature), Santos will evaluate impact and risk acceptability through the consideration of:

- impacts from other activities in the vicinity of the EP activities (e.g. historical drilling, trawl fishing activity, shipping, commercial developments).
- information provided from people and /or organisations who assert the cultural and spiritual connections.
- any expert assessment(s) from suitably qualified expert(s) people with relevant experience and credentials.
- culturally appropriate control measures raised by relevant people, organisations, or experts; or proposed by Santos and workshopped with relevant people, organisations, or experts.

Impact and risk evaluation of cultural and spiritual beliefs will not form part of an ENVID workshop, and a consequence (or risk) ranking will not be assigned. Instead, a qualitative assessment demonstrating that impacts and risks of the activity will be reduced to as low as reasonably practicable and be of an acceptable level will be presented in the Environment Plan as informed by the above considerations.

## 5.6 Evaluate if Impacts and Risks are as Low as Reasonably Practicable

For planned and unplanned events, an ALARP assessment is undertaken to demonstrate that the standard control measures adopted reduce the impact (consequence level) or risk to ALARP. This process relies on demonstrating that further potential control measures would require a disproportionate level of cost/effort in order to reduce the

level of impact or risk. If this cannot be demonstrated, then further control measures are adopted. The level of detail included within the ALARP assessment is based upon the nature and scale of the potential impact or risk. For example, more detail is required for a risk ranked as `Medium' compared to a risk ranked as `Low'.

## 5.7 Evaluate Impact and Risk Acceptability

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

- the consequence of a planned event is ranked as I or II; or a risk of impact from an unplanned event is ranked Very Low to Medium
- an assessment has been completed to determine whether further information or studies are required to support or validate the consequence assessment
- assessment and management of risks has addressed the principles of ecologically sustainable development
- the acceptable levels of impact and risks have been informed by relevant species recovery plans, threat abatement plans and conservation advice can be demonstrated
- performance standards are consistent with legal and regulatory requirements
- performance standards are consistent with the Environment Policy
- performance standards are consistent with industry standards and best practice guidance (e.g. *National Biofouling Management Guidance Guidelines for the Petroleum Production and Exploration Industry* [Marine Pest Sectoral Committee, 2018] and the *Australian Biofouling Management Requirements* [Department of Agriculture, Fisheries and Forestry, 2023])
- performance outcomes and standards have considered stakeholder feedback
- performance standards have been demonstrated to reduce the impact or risk to ALARP
- the consequence and risks associated with the proposed activity are not inconsistent with the relevant principles of ecologically sustainable development (ESD) under the EPBC Act as presented in Table 5-5.

**Table 5-5: Activity relevant principles of Ecologically Sustainable Development**

| No. | ESD principle | Relevance |
|---|---|---|
| (a) | **Integration principle**<br>Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social, and equitable considerations | Santos' environmental impact and risk assessment determines impact consequence levels considering the duration and extent of the impact, receptor recovery time and the effect of the impact at a population, ecosystem, or industry level. The Santos Environment Consequence Descriptors highlights the integration of long-term and short-term environmental, and socio-economic considerations (Appendix G).<br>The assessment of impact consequence levels for the proposed activity simultaneously assesses of the activity's potential implications against this principle. Additional assessment of this principle in relation to acceptability will not be conducted. |
| (b) | **Precautionary principle**<br>If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation | For planned activities, assessment of this ESD principle is inherent in Santos' environmental impact and risk assessment process, as Santos does not proceed with activities if the consequence of a planned event is ranked III (Moderate) or above. |
| (c) | **Intergenerational principle**<br>The principle of inter-generational equity—that the present generation should ensure that the health, diversity, and productivity of the environment is maintained or enhanced for the benefit of future generations | For planned activities, assessment of this ESD principle is inherent in Santos' environmental impact and risk assessment process, as Santos does not proceed with activities if the consequence of a planned event is ranked III (Moderate).<br>For an unplanned event, if the residual risk is ranked between Medium and Very High, an assessment against this principle is required.<br>The assessment of this principle is implemented through further details on ALARP assessment highlighting assurance that potential impacts and risks are managed, and the environment is maintained for the benefit of future generations.<br>Evaluation of the importance and relevance of stakeholder interest for this principle, if triggered, is fundamental in demonstrating that the environment is maintained for the benefit of future generations. |

| No. | ESD principle | Relevance |
|---|---|---|
| (d) | **Biodiversity principle**<br>The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making | Evaluate if there is the potential to affect biological diversity and ecological integrity. |
| (e) | **Valuation principle**<br>Improved valuation, pricing and incentive mechanisms should be promoted | This principle refers to activities which involve valuation, pricing and/or incentive mechanisms for the production, delivery, distribution or consumption of goods and services, especially those that are derived from natural or social capital or from ecological services.<br>This principle is not relevant to the proposed activity as the proposed activity does not involve the production, delivery, distribution or consumption of goods and services. |

# 6. Planned Activities Risk and Impact Assessment

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 21. Environmental Assessment** |
| Evaluation of environmental impacts and risks<br>21(5) The environment plan must include:<br>a) details of the environmental impacts and risks for the activity; and<br>b) an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk; and<br>c) details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level.<br>21(6) To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all the environmental impacts and risks arising directly or indirectly from:<br>a) all operations of the activity; and<br>b) potential emergency conditions, whether resulting from accident or any other reason.<br>21(7) The environment plan must:<br>a) set environmental performance standards for the control measures identified under paragraph (5)(c); and<br>b) set out the environmental performance outcomes for the activity against which the performance of the titleholder in protecting the environment is to be measured; and<br>c) include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met. |

ENVID workshops were held in September 2024 to identify and manage the environmental impacts and risks that may credibly arise from the activities associated with the petroleum activities. A refresher workshop was held on 1 May 2025 to ensure that the information was still current. This ENVID workshop for planned events identified seven planned environmental impacts associated with the activity. The consequence rankings resulting from the environmental assessments are summarised in Table 6-1. A comprehensive risk and impact assessment for each of the planned events, and subsequent control measures proposed by Santos to reduce the risk and impacts to ALARP and acceptable levels are details in the following subsections.

**Table 6-1: Summary of the consequence level rankings for hazards associated with planned events**

| EP Section | Hazard | Summary of Activity/Planned Event | Consequence Ranking |
|---|---|---|---|
| 6.1 | Interaction with other marine users | MODU presence, support vessel presence, helicopter presence, ROV presence, and operational and survey activities. | Minor |
| 6.2 | Seabed and benthic habitat disturbance | MODU and survey activities | Minor |
| 6.3 | Light emissions | MODU activities, support vessel activities, ROV activities, and flaring. | Negligible |
| 6.4 | Noise emissions | MODU activities, support vessel activities, ROV activities, helicopter activities, VAP and site surveys. | Minor |
| 6.5 | Atmospheric emissions | MODU activities, support vessel activities, helicopter activities and well clean-up. | Negligible |
| 6.6 | Planned operational discharges | MODU activities, support vessel activities and site survey activities. | Negligible |
| 6.7 | Drilling discharges | MODU drilling operations. | Minor |

# 6.1 Interaction with Other Marine Users

## 6.1.1 Description of Event

| | |
|---|---|
| **Event** | Interaction with other marine users may occur as a result of:<br>• MODU presence (including mooring) in the OAs<br>• Vessels, helicopter, ROV presence and operational activities<br>The MODU and support vessels required for the Activity will move within the OAs. A 500 m temporary safety exclusion zone will be established around the MODU during drilling activities and a 2,000 m cautionary zone will be established during anchor handling operations (for ~2–3 days either side of rig arrival and departure).<br>Activities have the potential to cause temporary displacement, or cause disturbance to other marine users. Other marine users include commercial fisheries, recreational fishers, and other oil and gas activities.<br>For commercial fisheries, the level of interaction could lead to temporary displacement to fishing grounds (see Section 3.2.7.3 for relevant fisheries).<br>Vessel and MODU presence could pose a navigational hazard and a collision risk (the risk of spills resulting from a collision if assessed in Section 7.6). |
| **Extent** | Within the OAs. |
| **Duration** | For the duration of the Activity. The duration of the Activity is expected to be ~40–110 days per well for drilling, with 7–14 days for survey activities per well if required. The Activity will be conducted over 24-hour operations and may be conducted over multiple campaigns over a 5-year period. |

## 6.1.2 Nature and Scale of Environmental Impacts

**Potential receptors**: Socio-economic (commercial fisheries, recreational fisheries, tourism, commercial shipping and petroleum activities).

These users may be temporarily displaced by the physical presence of the MODU and support vessels during the activity.

### 6.1.2.1 Commercial Fisheries

A number of state and Commonwealth fisheries overlap the OAs (see Section 3.2.7.3). There are four Commonwealth fisheries (North-West Slope Trawl Fishery, Western Skipjack Fishery, Western Tuna and Billfish Fishery and Southern Bluefin Tuna Fishery) that overlap the OAs. An analysis of current fishery closures, activity depth range, historical fishing data, fishing methods, and consultation feedback (see Section 4) indicates a low likelihood of interaction with commercial fisheries. None of the Commonwealth fisheries are expected to be active within the OAs (see Table 3-12).

The state Pilbara demersal Scalefish fisheries (includes trawl, trap and line fisheries) have been active in recent years over the OAs (see Section 3.2.7.3), specifically the Pilbara fish trawl (Interim) managed fishery which has catch in the Mestrel/Bancroft OA (Table 3-12).

Therefore, there is potential for interaction with this state commercial fishery during the activities in these OAs. However, in December 2025, the WA government implemented management changes across the state to protect at-risk demersal fish and help stocks recover for future generations. In the Pilbara region, recreational and charter fishing will remain open; a 50% catch reduction for commercial fisheries from 1 January 2026; and permanent closure of commercial trawl fishing for demersal scalefish from 1 January 2026.

Potential impacts are anticipated to be limited to operational inconveniences, such as brief displacement from fishing grounds. This displacement is expected to be minimal and temporary, confined to the OAs and exclusion zones, and will only last for the short duration of the activities.

### 6.1.2.2 Commercial Shipping

In the Pilbara region there is significant commercial shipping activity, the majority of which is associated with the mining and oil and gas industry. AMSA has introduced a network of commercial shipping fairways to reduce the risk of vessel collisions with offshore infrastructure. As shown in Figure 3-26, there are fairways to and from Port Hedland which overlap the Curie and Mestrel/Bancroft OAs. The typical vessel traffic within the recognised fairways ranges from 0–2 vessels per day (Mestrel/Bancroft OA) and 9–22 vessels per day (Curie OA) (AMSA, 2025). A commercial vessel transiting through the OAs would need to avoid the 500 m PSZ around the MODU. Although two of the four OAs intersect recognised AMSA fairways, potential impacts are limited to within 500 m of the MODU and are for a limited duration with each OA (~7–14 days for site surveys and 40–110 days for each well drilled) (see Section 6.1.5.1 for additional controls related to shipping fairway traffic).

### 6.1.2.3 Tourism and Recreation

No tourism related activities are expected to occur in the OAs, given the distance from the nearest coastline and areas of interest (Section 3.2.7.5). Sites of interest to tourists include places to fish, areas for sightseeing and secluded locations for general relaxation. Most of the tourism and recreation activities are confined to coastal areas and islands, plus luxury cruises that take tourists along the coastline and increasingly out to isolated coral atolls for fishing and diving. Consultation confirmed that no recent recreation or tourism is expected in the OAs and no concerns were raised by other marine users.

### 6.1.2.4 Recreational Fisheries

Due to the distance offshore it is unlikely recreational fishing and tourism activities will take place within the OAs. Recreational fishing and tourism is likely to occur within shallower waters closer to the mainland coast inshore and around reefs located outside of the OAs. Consultation with recreational fishers has raised no concerns about the activities.

### 6.1.2.5 Traditional Fisheries

Indigenous subsistence fishing may occur in shallow waters, close to the coastline in excess of 90 km from the OAs, and therefore interactions with traditional fisheries will not occur. Consultation with First Nations Peoples did not raise concerns regarding traditional fisheries and the Activity.

### 6.1.2.6 Cumulative Impacts

Commercial fisheries utilising the region (e.g. the Pilbara fish trawl) are expected to navigate around the relatively small areas of exclusion in accordance with safe navigational practices. Where two MODUs and support vessels operate concurrently in separate OAs, the area of temporary exclusion may be larger due to the combined presence of multiple exclusion and cautionary zones, however the two areas would not overlap given the spatial separation of the OAs (>11 km between OAs). Given the short duration of the drilling activities, the spatial separation of the MODUs and support vessels within separate OAs and the small area of displacement (500 m exclusion zones), any potential cumulative impacts other marine users would remain localised and have no lasting impact.

## 6.1.3 Environmental Performance Outcomes and Control Measures

The EPO relating to this event is:

- Reduce impacts on other marine users through the provision of information to relevant stakeholders such that they can plan for their activities and avoid unexpected interference [BB-EPO-01]

The standard control measures (CM) considered for this Activity are shown in Table 6-2, with environmental performance standards (EPSs) and measurement criteria for the EPOs described in Table 8-2.

**Table 6-2: Control measures evaluation for interaction with other marine users**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-01 | Maritime Notices | Administrative | Ensures the presence of the MODU and activities is available on the AHO notifications to maritime users, reducing likelihood of interactions. | Negligible costs | **Adopted** Maritime requirement to issue maritime notices. |
| BB-CM-02 | Santos stakeholder consultation strategy | Administrative | Santos will notify all relevant stakeholders listed, or as revised, in Section 4, details prior to commencement of the activity including the activity timing and vessel movements. Ensures other marine users, such as commercial fishers, are aware of upcoming operations so they can | Limited additional costs to Santos.<br><br>Stakeholders' time required to review consultation material and communicate with Santos. | **Adopted** Benefits outweigh negligible costs. Important control to ensure other marine users are aware of upcoming operations and potential |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | plan their business accordingly | | business disruptions. |
| BB-CM-03 | Petroleum Safety Zone (500 m) and Cautionary Zone (2,000 m during anchor handling operations (for 2–3 days either side of rig arrival and departure)) established | Isolate | The exclusion zone prevents vessels from getting too close and causing damage to equipment of either party. The Cautionary Zone alerts other marine users to the presence of the MODU. | No additional costs.<br>Other marine users may be temporarily excluded from small areas. | **Adopted**<br>Benefits considered to outweigh costs to Santos. |
| BB-CM-04 | MODU identification system | Engineering | Reduces potential for interaction with other users during MODU moves. | Negligible costs, standard equipment on MODU. | **Adopted**<br>Benefits considered to outweigh costs to Santos. |
| BB-CM-05 | No fishing from MODU or support vessels | Administrative | Reduce potential impacts to fisheries in the vicinity of the activity. | Negligible costs. | **Adopted**<br>Benefits considered to outweigh costs to Santos. |
| BB-CM-06 | Support vessel | Protective | Minimises risk of collision through visual identification and avoidance of other vessels. | Required to support the activity | **Adopted**<br>Benefits considered to outweigh costs to Santos. |
| BB-CM-07 | Lighting will be used as required for safe work conditions and navigational purposes | Engineering | Ensures the MODU and support vessels are seen by other marine users.<br>Reduces risk of environmental impact from vessel collisions due to ensuring maritime safety requirements are fulfilled. | No additional costs to Santos. Standard requirement for vessel navigation lighting and equipment to be compliant with COLREGS / Marine Orders 30: Prevention of Collisions, and with Marine Orders 21: Safety of Navigation and Emergency Procedures. | **Adopted**<br>This is a maritime requirement. |
| BB-CM-08 | Seafarer certification | Administrative | Requires appropriately trained and competent personnel to navigate MODU and vessels to reduce interaction with other marine users. | Costs associated with personnel time in obtaining qualifications. | **Adopted**<br>This is a legislated requirement. |
| BB-CM-09 | Constant bridge watch (visual and radar) | Protective | Crew of the primary vessels will maintain constant bridge watch, including for third party vessels which may be approaching or enter the exclusion zone. | No additional costs. | **Adopted**<br>No additional costs.<br>It is a maritime requirement. |
| BB-CM-10 | Pre-lay anchors are marked with surface buoys when semi-submersible MODU is not connected | Administrative | Increases visibility over infrastructure so that other marine users can avoid the area. | Cost associated with installation of buoys. | **Adopted**<br>Benefits considered to outweigh negligible costs to Santos. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| BB-CM-11 | Marine assurance standard | Administrative | Ensures contracted vessels are operated, maintained and manned in accordance with industry standards and regulatory requirements (this EP) and the relevant Santos procedures mentioned in this EP. | No additional cost. | **Adopted** Benefits considered to outweigh negligible costs to Santos. |
| BB-CM-12 | MODU move procedure | Administrative | No accidental contact with the seabed or subsea infrastructure (e.g. submarine telecommunications cables) during the MODU move. | Personnel costs associated with ensuring procedures are in place and implemented during inspections | **Adopted** Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time. |
| **Additional Control Measures** | | | | | |
| BB-CM-13 | Work with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel/Bancroft and Curie OAs (see Section 6.1.5.1) | Elimination | Reduces potential interaction with other marine users by avoiding peak shipping traffic in recognised shipping fairways during the activity. | Possible time and coordination costs with AMSA; may affect drilling schedule flexibility. | **Adopted** The safety benefits considered to outweigh costs to Santos. |
| BB-CM-64 | Actively pursue regular meetings with AMSA to progress planning and implementation of modification of shipping fairways in Bedout basin, to drill wells currently located in shipping fairways – throughout the life of the EP. | Elimination | potential interaction with other marine users by avoiding peak shipping traffic in recognised shipping fairways during the activity.<br>Ensures safety of navigation is upheld | Possible time and coordination costs with AMSA; may affect drilling schedule flexibility.<br>Possible cost of implementing additional AMSA requirements as part of fairway modifications. | **Adopted** The safety benefits considered to outweigh costs to Santos |
| BB-CM-66 | Actively engage with AHO on proposal to modify shipping fairways for safe navigation, when drilling within the Bedout basin. | Administrative | Reduces potential interaction with other marine users by ensuring navigation charts are updated to show any modifications to shipping fairways.<br>Ensures safety of navigation is upheld. | Possible time and coordination costs with AMSA may impact on timing for engagement with AHO and affect drilling schedule flexibility. | **Adopted** The safety benefits considered to outweigh costs to Santos |
| BB-CM-14 | If drilling in a shipping fairway, MODU Racon Unit installed prior to MODU arrival | Engineering | Reduces potential for interaction with other users during MODU moves. Installation of RACON unit on MODU is an additional navigational radar aid for commercial shipping traffic utilising shipping fairways. | Costs associated with RACON unit installation and operation. | **Adopted** The safety benefits of a RACON outweighs any cost given the location of the OAs to known shipping fairways. |
| BB-CM-15 | If drilling in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to | Engineering | Reduces potential for interaction with other users during MODU moves. | Costs associated with additional system | **Adopted** The safety benefits outweigh any |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | electronic navigation systems | | | | cost given the location of the OAs to known shipping fairways. |
| BB-CM-16 | For drilling activities within a shipping fairway, a support vessel can act in the capacity of a guard vessel in place during the activity to reduce potential for collision or interference with other marine users. | Protective | Identifies and communicates with approaching third-party vessels to ensure exclusion (safety) zone is observed, preventing potential interaction or interference. | Vessel will have support and guard duties. | **Adopted.** The safety benefits considered to outweigh costs to Santos |
| BB-CM-17 | Adaptive Management Plan/Vessel traffic management plan for when drilling within a shipping fairway | Administrative | Vessel traffic management plan, reduces likelihood of vessel collision and oil spill potential | Costs associated with plan development and industry consultation. | **Adopted** Safety benefits considered to outweigh considerable costs to Santos |
| N/A | Manage the timing of the activity to avoid peak marine user periods (e.g. commercial fishing and shipping) | Substitute | Would eliminate potential impacts to other marine users. | Not considered feasible as marine users could potentially be in the area all year round. The area that stakeholders are excluded from is small when compared to the area available to other marine users. | **Not adopted** Stakeholders and shipping in the area all year round. Cost grossly disproportionate to low socioeconomic benefit, given the scale of impact and the area available to other marine users. |
| N/A | Add additional warnings and/or lights to attract attention | Protective | Potential reduction in risk of collisions. | As per BB-CM-07, vessels shall comply with Marine Order Part 30: Prevention of Collisions, and with Marine Order Part 21: Safety of Navigation and Emergency Procedures, requires vessels to have navigational equipment to avoid collisions. Additional warnings and/or lighting would require retrofitting vessels, requiring additional financial and logistic costs disproportionate to any environmental benefit. | **Not adopted** Already compliant. Cost is disproportionate to increase in environmental benefit. |
| N/A | Revise OAs or well locations to be outside of fairways | Eliminate | Reduces interaction with shipping vessels using known fairways | It is not feasible for the Curie and Mestrel/Bancroft OAs to be located | **Not adopted** |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | outside of shipping fairways. Key prospects sit almost wholly underneath the shipping fairways. Drilling wells vertically and entirely outside of these fairways would prevent intersection of the prospect, and prevents the optimal economic location.<br>The wells within these OAs are targeting specific target formations and it is not feasible to drill a well outside of a prospect as that fails to meet exploration commitments | Not feasible given the high cost |
| N/A | Alternative methods to access subsurface targets situated below shipping fairways | Eliminate | Reduces interaction with shipping vessels using known fairways | This style of well is extremely challenging to design and execute. These types of techniques are typically utilised for field development (production wells) where substantial amounts of subsurface data are available for engineering and planning which enables mitigation of operational risk.<br>For exploration drilling, there is inadequate data available to plan complex, extended or extreme reach wells.<br>Given the width of the shipping fairways of 3 nm (~5.6 km), this is not considered feasible when also accounting for the deep vertical depth of the subsurface targets<br>Therefore, alternative drilling techniques such as deviated / horizontal / | **Not adopted**<br>Not technically feasible |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | extended reach wells (including vertically) are assessed as not technically feasible | |

### 6.1.4 Environmental Impact Assessment

| Receptor | Consequence Level |
|---|---|
| **Interaction with other Marine Users** | |
| Threatened, migratory or local fauna | N/A |
| Physical environment or habitat | |
| Threatened ecological communities | |
| Protected areas | |
| Socio-economic Receptors | The impact of the MODU and vessel operations on socio-economic receptors are considered to be II – Minor due to the fact that:<br>• Tourism activities are not expected to occur in the OAs given the water depth, lack of seafloor features and distance from shore.<br>• Additional controls to ensure communication of activity details and exclusion zone and communication with active fishermen are in place.<br>• Vessels could be expected to divert around the OAs, but this would be a temporary exclusion given the duration of the activity<br>• Any cumulative impacts from concurrent activities would be localized with no lasting impacts<br>• Additional controls to manage activities and interactions with other marine users in shipping fairways have been adopted. |
| Overall Worst-case Consequence | II-Minor |

### 6.1.5 Demonstration of As Low as Reasonably Practicable

There are no viable alternatives to using a MODU and vessels for the Activity, and a 500 m PSZ around the MODU will be established in accordance with the OPGGS Act. To assess the potential impacts associated with the MODU, vessels, and the MODU exclusion zone, a range of standard control measures are in place (Table 6-2).

Maritime notices will be issued to inform other marine users of the location and nature of the activity, reducing the likelihood of unintentional interaction. In addition, Santos' stakeholder consultation strategy has been implemented to ensure relevant stakeholders are aware of the proposed activities, exclusion zones, and the expected timing, allowing them to plan accordingly. A 500 m PSZ around the MODU will be established to isolate the activity and minimise the risk of vessel collisions, with support vessels also present to assist in the visual identification of third-party vessels. A 2,000 m Cautionary Zone will also be established around the MODU during anchor handling operations (for 2–3 days either side of rig arrival and departure) to alert other marine users to the MODU and support vessel presence in the operational area.

The MODU will utilise standard identification systems to maintain visibility to other marine users. Lighting will be used as required for safe working conditions and navigation, consistent with COLREGS and Marine Orders, ensuring the MODU and support vessels are easily visible, thereby reducing collision risk. No fishing will be permitted from the MODU or support vessels to minimise potential interaction with fisheries. Seafarer certification will be maintained to ensure that all personnel navigating the MODU and vessels are appropriately trained and competent, reducing the potential for human error. A constant bridge watch, including visual and radar monitoring, will be maintained on all primary vessels throughout the activity to promptly identify and respond to approaching third-party vessels. Where pre-lay anchors are installed for the semi-submersible MODU, surface buoys will be used to mark their location when the MODU is not connected, further enhancing visibility. All contracted vessels will comply with Santos' marine assurance standards to ensure vessels are operated, maintained, and crewed to industry and regulatory standards.

Santos has considered alternative methods to access subsurface targets situated below shipping fairways such as drilling of deviated / horizontal wells. However, given the width of the shipping fairways of 3 nm (~5.6 km), this is not considered feasible when also accounting for the deep vertical depth of the subsurface targets. This style of well is extremely challenging to design and execute and these types of techniques are typically utilised for field development (production wells) where substantial amounts of subsurface data are available for engineering and planning, which enables mitigation of operational risk. For exploration drilling, there is inadequate data available to plan complex, extended or extreme reach wells. Therefore, alternative drilling techniques such as deviated / horizontal / extended reach wells (including vertically) are assessed as not technically feasible.

#### 6.1.5.1 Management of shipping fairways and safety of navigation

In July 2012, AMSA announced an AHO charted network of Shipping Fairways off the North West coast of Australia to direct large vessels—bulk carriers, LNG carriers and other SOLAS-class ships—into predefined routes that keep them clear of existing and planned offshore petroleum infrastructure. The Curie and Mestrel/Bancroft OAs intersect these shipping fairways (Figure 3-26).

Use of the fairways is strongly recommended (though not mandatory) and intended to reduce the risk of collision with man-made installations by providing separation and predictability of traffic routes. The Dampier Shipping Fairway (2007) was cited as a successful precedent, and the new fairways were progressively incorporated into both Electronic Nautical Charts (ENCs) and paper charts.

Temporary fairway modifications are an established tool to preserve safety of navigation during short-duration operations (e.g. MODU campaigns, salvage works, infrastructure maintenance, national events). Where residual risk to transiting SOLAS-class vessels would otherwise remain elevated  regulators globally have supported time-bound restrictions and clearly communicated rerouting, provided there is adequate consultation and impact assessment.

Santos engaged an independent third-party consultant to investigate the options for shipping fairway management, in consultation with AMSA, to establish a low risk and ALARP approach to drilling within these fairways. In preparing the approach, relevant guidance and regulatory frameworks were consulted, including:

- NOPSEMA – *Safety Zone Assessments Policy* (2025) and *Risk Assessment Guidance Note* (A122420), ensuring consistency with the OPGGS Act 2006.
- AHO – Australian Hydrographic Office – as the authority responsible for Notices to Mariners (NtMs) and updating nautical charts.
- International Organization for Marine Aids to Navigation (IALA) Guidelines – G1018 (*Risk Management*) and G1138 (*Simplified IALA Risk Assessment)* aligning with international best practice.
- Precedents – both temporary closures and deviations of fairways both in Australia and internationally, confirming the legitimacy of such measures as proportionate risk controls.

Consistent with best practice, shipping fairway management requires that structured communication and engagement is undertaken to ensure all relevant persons and authorities are engaged in a timely and transparent manner.

During consultation for this EP, Santos consulted with AMSA regarding proposed fairway management options, and proposed control measures relating to interaction with other marine users (see consultation summary report in Annexure F). Santos undertook a risk assessment of alternative shipping fairway modifications and presented this information to AMSA for endorsement.  Although agreement has not yet been reached on the final approach, Santos will continue to engage with AMSA, to ensure the requirements for fairway modification are met; and will also continue to engage with AMSA via regular meetings to ensure ongoing safety of navigation is upheld – throughout the life of this EP (BB-CM-64).

For this EP, Santos proposes management of shipping fairway traffic through:

- working with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel/Bancroft and Curie OAs (BB-CM-13)
- actively pursue regular meetings with AMSA to progress planning and implementation of modification of shipping fairways in the Bedout Basin, to drill wells located in shipping fairways - throughout the life of this EP (BB-CM-64)
- actively engage with AHO on the proposal to modify shipping fairways for safe navigation in the Bedout basin and to ensure nautical/navigational charts are updated following any shipping fairway modifications (BB-CM-66)
- dedicated notices to mariners
- development of an Adaptive Management Plan/Vessel Traffic Management Plan for when drilling within a shipping fairway (BB-CM-17).

The Adaptive Management Plan (BB-CM-17) will describe the process for:

- shipping fairway modification
- identification /adoption of alternative fairway options
- engagement with relevant stakeholders include AMSA, NOPSEMA, AHO, Pilbara Ports Authority, shipping operators, fisheries representatives, and First Nations groups with cultural connections to sea country.
- notifications schedule
- execution/timing of closures/modifications
- adaptive management (e.g. changes in timing of activity).

Additional safety controls have also been adopted for activities undertaken in shipping fairways, including the installation of a RACON unit on the MODU to enhance radar visibility to third-party vessels transiting in shipping fairways (BB-CM-14). An AIS AtoN device will also be used to broadcast the MODU position to electronic navigation systems (BB-CM-15) The support vessel will act in the capacity of a guard vessel when activities occur in a shipping fairway to identify and communicate with approaching third-party vessels, including during survey activities prior to MODU arrival (BB-CM-16).

Santos' MODU move procedure (BB-CM-12) includes a clear passage plan to ensure no accidental contact any subsea infrastructure (such as submarine telecommunications cables) during the MODU move.

The controls will ensure the impacts and risks associated with conducting activities within a shipping fairway are continuously managed to ALARP and acceptable levels.

Several additional control measures were considered (Table 6-2) but not adopted on the basis that they would not provide a proportionate environmental or safety benefit relative to their cost or feasibility. Managing the timing of the activity to avoid peak marine user periods (e.g. commercial fishing and shipping seasons) was considered but ultimately not adopted. Marine users are present in the region year-round, and the area temporarily unavailable due to the exclusion zone is small compared to the available marine area, including commercial fishing zones and shipping fairways. Attempting to shift activity timing would impose operational delays and the cost would be grossly disproportionate to the limited benefit achieved.

Installation of additional warnings or lighting beyond the requirements under Marine Order 30 (Prevention of Collisions) and Marine Order 21 (Safety of Navigation and Emergency Procedures) was not adopted. The MODU and vessels will already be compliant with these maritime safety regulations, and any retrofitting to install additional systems would incur disproportionate financial and logistical costs without materially improving environmental outcomes. Santos has commitments to the Government to drill within its NOPTA issued titles. Relocating the OAs outside of shipping fairways was also assessed and not adopted. The location of the wells is dictated by specific geological targets, and moving the tophole location would require significant directional drilling, leading to increased costs, technical complexity that was assessed as not feasible, and a higher volume of drill cuttings being discharged. Given the scale and duration of the drilling activities and the small size of the PSZ (500 m) compared to the wider marine area available to other users, the potential benefits of relocating the wells would not outweigh the environmental and financial costs. Therefore, these additional controls were not adopted.

To ensure that the risks remain ALARP, Santos will continue to engage with AMSA over the life of the EP, to implement feasible additional controls identified (BB-CM-13 and BB-CM-17) and through the Management of Change (MOC) process detailed in Section 8.10.2. AHO will be notified of any amendments to shipping fairways, for the purpose of updating navigation charts (Table 8-4).

All practical control measures have been reviewed (Section 6.1.3), and those adopted, as detailed in Table 6-2, are considered appropriate to manage the impacts such that the residual consequence is assessed to be II – Minor and cannot be reduced further. The proposed management controls for interactions with other marine users are in accordance with the Santos' risk management criteria and are considered appropriate to manage the risk to ALARP.

### 6.1.6 Acceptability Evaluation

| | |
|---|---|
| **Is the consequence ranked as I (Negligible) or II (Minor)?** | Yes – maximum consequence from interaction with other marine users is II – Minor. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with *Santos' Environmental Hazard Identification and Assessment Procedure*, which considers principles of ESD. |
| **Are risks and impacts consistent with relevant legislation, international agreements and** | Yes – management consistent with Safety of Life at Sea (SOLAS) 1974 and *Navigation Act 2012*. |

| | |
|---|---|
| **conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | Santos has undertaken extensive consultation with AMSA regarding OAs which overlap shipping fairways and has committed to continue to engage with AMSA on this matter. Additional controls (BB-CM-13 and BB-CM-17 and BB-CM-64) have been adopted to address the risks and impacts of drilling in shipping fairways, |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes-see ALARP above. |

The presence of the MODU and vessels is unlikely to significantly impact other marine users, including commercial fisheries and shipping traffic, due to the following factors:

- the 500 m PSZ around the MODU is small compared to the broader areas available for shipping and navigation.
- the activity's short duration for each well, ranging from ~40–110 days (subject to weather, operational requirements, equipment, and drilling conditions).
- additional controls to ensure impacts to shipping fairway traffic are reduced to levels which are acceptable and ALARP (BB-CM-13 and BB-CM-17).
- stakeholder feedback has not identified any major concerns from relevant persons.

An exclusion zone around the MODU is mandated by maritime legislation, and the proposed controls will ensure that other users are informed of its location and can navigate safely. As a result, potential impacts are considered ALARP and environmentally acceptable.

# 6.2 Seabed and Benthic Habitat Disturbance

## 6.2.1 Description of Event

| | |
|---|---|
| **Event** | Potential seabed disturbance in the OAs may occur from the following sources:<br>• Semi-submersible MODU positioning (pre-lay anchoring/temporary mooring system)<br>• Jack-up MODU positioning (MODU spud placement and jetting to release legs during demobilisation)<br>• ROV activities (placement of the ROV and tooling on the seabed)<br>• survey (geotechnical works such as coring, grab samples and cone penetrator testing)<br>Activities may disturb the seabed and benthic habitats through direct physical disturbance and associated disturbance to habitats and biota (from positioning infrastructure on the seabed), as well as through indirect impacts on benthic habitats and marine fauna (from increases in turbidity and sedimentation as a result of sediment disturbance).<br>Seabed disturbance associated with drilling discharge is described in Section 6.7.<br>For solid objects that may be accidentally dropped overboard and are heavy enough to sink through the water column and land on seabed, see Section 7.1. |
| **Extent** | Physical disturbance of seabed from:<br>• Jack-up MODU spud cans 950 $m^2$ (three legs)<br>• Semi-submersible MODU anchoring pre-lay moorings (210 $m^2$ per anchor and 2,520 $m^2$ for 12 anchors, per well)<br>• Cone penetrator (CPT) (5 $m^2$)<br>• Grab sampling (5 $m^2$ per sample)<br>• ROV activities (5 $m^2$ positioned on the seabed) |
| **Duration** | Seabed disturbance from the MODU spud cans and anchoring will be temporary for the duration of the activity and limited to within the OAs with recovery within weeks to months following removal from the seabed within the area. Geotechnical investigations using CPT or grab samples disturbance is relatively small and occurs once if a jack-up MODU is used, recovery occurs within weeks. |

## 6.2.2 Nature and Scale of Environmental Impacts

**Potential receptors**: Physical environment (water quality, benthic habitats and fauna) and threatened, migratory or local fauna.

- Operational activities have the potential to impact the seabed and benthic habitat through the following:
- direct physical disturbance of a sea of seabed habitat including benthic fauna.
- indirect disturbance to benthic habitats and associated marine fauna by sedimentation.
- increased turbidity of the near-seabed water column.

The potential impacts to the seabed and benthic habitats from drilling discharges are discussed in Section 6.7.

### 6.2.2.1 Physical Environment (water quality, benthic habitats and fauna)

The positioning of the MODU and other activities contacting the seabed (geotechnical investigations, ROV placement) will involve direct contact with the seafloor, causing localised impacts to benthic habitats and associated fauna within the OAs. The OAs are not known to contain significant or unique benthic habitats, with the majority being broadly homogenous and consisting of two main types: silt/sand sediment and rubble habitats, both of which support limited macro-benthic biota. Filter feeder habitats are generally sparse, with moderate diversity only in specific, topographically complex areas where harder substrates and rubble are present. Most habitats consist of bioturbated sediment and non-habitat forming species, with significant areas of soft sediment and occasional patches of more diverse filter-feeder communities. For detailed characteristics and specific ecological features of each OA, see Table 3-4.

The water depths within the OAs range from 80–265 m. At these depths, the development of benthic primary producer habitats is unlikely due to insufficient light reaching the seafloor. The seafloor in the region is regularly affected by cyclonic storms and is subject to some of the highest tidal energy observed globally, which can resuspend sediments and cause sediment movement across the seabed.

The potential impacts of seabed disturbance from the planned activities are considered minor for the following reasons:

- depressions created by jack-up MODU spud cans are expected to naturally refill due to sediment movement by water currents and the deposition of detrital material. A jetting system may be used to free the jack-up legs

during demobilisation and prior to the MODU being jacked down and demobilised. During this period, there is an increase in sediment disturbance and localised turbidity as water is pumped down the legs to the seabed. Local turbidity in the water column resulting from the jack-up jetting system will result in highly localised smothering of the benthic environment as the sediment settles on the seabed, any impacted benthic communities are expected to rapidly recolonise. While the jetting system will increase turbidity in the water column for a short period (approximately one hour per leg), it will be highly localised and will not result in any impact other than behavioural to marine fauna in the immediate vicinity.

- semi-submersible MODU anchor deployment may cause localised, temporary turbidity increases near the seabed and direct physical impacts on benthic habitats, leading to minor, longer lasting effects on the seabed and benthic communities.
- small scale localised disturbance to the seabed from survey activities given the small areas of disturbance.
- soft sediment habitats recover and recolonise relatively quickly, meaning any impacts will be short-term and temporary.
- there are no known sensitive seabed features (e.g. reefs, canyons, shipwrecks) or benthic primary producer habitats (e.g. hard corals, seagrass, macroalgae, mangroves) within the OAs.

#### 6.2.2.2 Cultural Receptors

There are no known records of cultural heritage features within the OAs. Stakeholder feedback requested management measures in place for the protection of underwater cultural heritage

#### 6.2.2.3 Threatened, Migratory or Local Fauna

Habitat modification is noted as a potential threat to several marine fauna species in relevant recovery plans and conservation advice (Table 3-11), including *the Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017). However, the scale of seabed disturbance and any associated turbidity is not expected to significantly impact marine fauna such as marine mammals, marine reptiles, sharks, rays, and other fish.

#### 6.2.2.4 Cumulative Impacts

Where two MODUs and support vessels operate concurrently in separate OAs, localised seabed disturbance may occur concurrently rather than sequentially. Disturbance from jack-up spud can depressions, semi-submersible MODU anchor deployment, and survey activities will remain localised and temporary and are not expected to overlap given the distance between OAs (>11 km). The open offshore setting, lack of sensitive seabed features, and natural sediment mobility means any disturbance will remain minor and short-term, with no cumulative impacts expected.

### 6.2.3 Environmental Performance Outcomes and Control Measures

The EPOs relating to this event are:

- Seabed disturbance is limited to planned activities and defined locations within the OAs [BB-EPO-02]
- Do not displace marine turtles from habitat critical to the survival of the species or disrupt biologically important behaviours from occurring within BIAs [BB-EPO-03]

The standard CM considered for this activity are shown in Table 6-3 with EPSs and measurement criteria for the EPOs described in Table 8-2

**Table 6-3: Control measures evaluation for seabed disturbance**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-18 | MODU station keeping system (semi-sub) | Engineering | Maintains the MODU at the desired location and provides for minimising length of mooring line deployed during anchor installation, therefore reducing potential risks to seabed habitat. | No cost/issue identified. | **Adopted** Safety critical feature that maintains the semi-sub MODU on location. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| BB-CM-12 | MODU move procedures | Engineering | No accidental contact with the seabed or subsea infrastructure (e.g. submarine telecommunications cables) during the MODU move. | Personnel costs associated with ensuring procedures are in place and implemented during inspections. | **Adopted** Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time. |
| BB-CM-19 | Recovery of all deployed equipment (including pre-lay equipment and anchors) | Eliminate | Prevents ongoing impact to the seabed due to drilling equipment being left in situ | Minimal additional cost to recover equipment. | **Adopted** Helps to minimise impacts and extent of seabed disturbance. |
| BB-CM-20 | Anchoring | Administrative | No planned anchoring for support vessels within OA reduces seabed disturbance area as no anchor or anchor chain drag/placement. | Costs associated with implementing procedures. | **Adopted** Benefits considered to outweigh costs. |
| BB-CM-21 | Site surveys | Engineering | Site surveys confirm the proposed MODU mooring or jack-up locations are free from seabed features, debris and sensitive benthic features. | Costs associated with conducting site surveys. | **Adopted** Benefits considered to outweigh costs. |
| **Additional Control Measures** | | | | | |
| BB-CM-22 | Cultural Heritage Management – Unexpected finds protocol | Administrative | Provides guidance in the event that an unexpected maritime archaeology or cultural heritage find is encountered. By implementing the protocol, potential impacts to maritime cultural heritage objects and values will be minimised. | Costs associated with implementing the procedures. | **Adopted** Benefits outweigh the costs. |
| BB-CM-65 | Monitoring of mooring equipment | Engineering | Mooring equipment will be subject to ongoing monitoring throughout operations, to ensure it remains in place to minimise seabed disturbance and maintain operational safety. | Minor costs associated with implementing monitoring | **Adopted** Benefits outweigh the costs |
| N/A | Use of a DP MODU | Substitute | Would reduce seabed disturbance as no contact of MODU with the seabed if DP used. | Not technically feasible to use a DP MODU as the water depth is too shallow. | **Not adopted** Not technically feasible since the water depth is too shallow. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | Increase in emissions, fuel, noise from DP. | |

### 6.2.4 Environmental Impact Assessment

| Receptor | Consequence Level |
|---|---|
| **Seabed Disturbance** | |
| Threatened, migratory or local fauna | There are no known sensitive seabed features within any of the OAs.<br>The benthic habitats within the OAs are broadly homogenous and comprised of two main types: soft sediment seabed and sandy and muddy substrates and no evidence of rock outcropping or coral reef development. The benthic habitat within the OAs, primarily consisting of broad silty-sand and rubble substrates with low structural complexity and limited macro-benthic biota, is widespread across the Northwest Shelf. This habitat type, characterized by bioturbated sediments, non-habitat forming species, and sparse filter-feeder communities, is resilient and expected to recover quickly from any direct disturbances. The prevalence of soft sediment and mobile substrates further contributes to its natural recovery potential, allowing benthic communities to re-establish following minor impacts. For details see Table 3-4 and Figure 3-3.<br>Marine invertebrates, including filter feeders like sponges and soft corals, may be present but are not expected in significant quantities. The small area of potential impact is unlikely to affect prey availability or protected species.<br>The Mestrel/Bancroft OA is directly adjacent to the reproduction (internesting buffer) BIA for flatback turtles (Figure 3-17). However, flatback turtle reproduction typically occurs in shallower waters than those in the OA (Pendoley Environmental Pty Ltd, 2017; Whittock et al., 2016). Given that depths of 80–265 m are unsuitable for reproduction, any displacement of turtles from the OA is unlikely to affect their reproduction, as ample suitable habitats are available nearby.<br>Benthic habitat disturbance from the activity will be short term and temporary. The overall consequence level is considered I – Negligible. |
| Physical environment or habitat | The area of physical environment and habitat affected by the proposed activities is relatively small compared to the broader extent of similar habitats in the surrounding environment. Where two MODUs and support operate concurrently in separate OAs, the localised seabed disturbance may occur concurrently rather than sequentially. However, due to spatial separation of the OAs (>11 km between OAs), disturbance will remain localised and is expected to disperse rapidly given the strong offshore currents. The OAs also lack any sensitive seabed features and therefore no significant impacts are expected from operation of two MODUs simultaneously in separate OAs.<br>This area is expected to recover after the disturbance. Therefore, long-term or significant impacts on habitat values or ecosystem functions are unlikely.<br>The impacts to the physical environment or habitat are assessed as II – Minor. |
| Threatened ecological communities | Not applicable – No threatened ecological communities are identified in the area where seabed disturbance could occur. |
| Protected areas | Not applicable – The OAs do not intercept any protected areas. |
| Socio-economic receptors | The disturbance of the seabed and benthic habitat within the OAs is unlikely to affect socio-economic receptors like shipping and commercial fishing. No stakeholder concerns have been reported regarding this issue.<br>EP consultation raised the importance of management measures related to underwater cultural heritage. Santos has committed to implementation of the Unexpected Finds Protocol (BB-CM-22). |
| Worst-case consequence level | II-Minor |

### 6.2.5 Demonstration of As Low as Reasonably Practicable

A range of standard control measures (Table 6-3) to ensure the impacts to seabed and benthic habitats are reduced to ALARP. The semi-submersible MODU will utilise a station keeping system to maintain its position and minimise the length of mooring lines deployed during anchor installation, thereby reducing the potential seabed footprint. The recovery of all deployed equipment, including pre-lay equipment and anchors, will be undertaken to prevent any ongoing seabed disturbance from abandoned infrastructure.

Site surveys will be conducted to confirm that the seabed at jack-up location are free from sensitive seabed features and debris prior to activities. Jack-up locations will further be verified with ROV video to verify the findings

from previously conducted surveys, which will both ensure disturbance is limited to a flat and featureless seabed location as well as mitigate risk of damage to equipment.

Where there is uncertainty regarding suitability of seabed conditions for mooring of semi-submersible MODUs, site surveys will be undertaken. Mooring equipment will be subject to ongoing monitoring throughout operations (CM-BB-65) to ensure it remains in place to minimise seabed disturbance and maintain operational safety. Anchoring of support vessels within the OAs will not be permitted under normal operations, further minimising seabed interaction and the potential for anchor or chain drag across the seafloor.

The Unexpected Finds Protocol (BB-CM-22) will be implemented when undertaking any activity that is in proximity to the seabed or involves seabed contact. This protocol provides guidance in the event that an unexpected maritime archaeology or cultural heritage find is encountered. By implementing the protocol, potential impacts to maritime cultural heritage objects and values will be minimised.

An additional control measure was also considered (Table 6-3) but not adopted. Employing a dynamically positioned (DP) MODU, which would avoid seabed disturbance from anchors or spud cans, was considered, but ultimately not adopted. The shallow water depths at the Mestrel/Bancroft OA means that the use of a DP-only MODU is not technically feasible in this OA. Additionally, sourcing a suitable DP MODU would have significant cost and scheduling impacts, while providing only minor environmental benefit given the localised and temporary nature of the disturbance. Use of a DP MODU would also result in an increase in emissions, fuel consumption, and underwater noise. Consequently, the use of a DP MODU was not adopted on the basis that the cost and environmental trade-offs were grossly disproportionate to the benefits.

The planned seabed disturbance will be confined to the placement of anchors (for a semi-submersible MODU) or spud cans (for a jack-up MODU) within specific installation footprints within each OA. This will affect a small area of benthic habitat, primarily soft sediments, which are widely distributed throughout the Northwest Shelf Province. No sensitive or significant benthic features have been identified within the OAs. The disturbance is expected to be highly localised, and natural recovery of the seabed is anticipated to occur within weeks to months following completion of the activity.

All practical control measures have been reviewed (Section 6.2.3), and those adopted, as detailed in Table 6-3, are considered appropriate to manage the impacts such that the residual consequence is assessed to be II – Minor and cannot be reduced further. The proposed management controls for seabed disturbance are in accordance with the Santos' risk management criteria and are considered appropriate to manage the risk to ALARP.

### 6.2.6 Acceptability Evaluation

| | |
|---|---|
| **Is the consequence ranked as I (Negligible) or II (Minor)** | Yes – maximum consequence from seabed and benthic habitat disturbance is II – Minor. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure which considers principles of environmentally sustainable development.<br>The consequence against this aspect is II – Minor and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – No plans identified seabed disturbance as those described above as being a threat to marine fauna or habitats.<br>Management of the activity is consistent with relevant species recovery plans, conservation management plans, objectives and actions, including but not limited to the *Recovery Plan for Marine Turtles in Australia 2017–2027* (Commonwealth of Australia, 2017). |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | The Underwater Finds Protocol will be implemented.<br>During public comment period, comment was raised regarding seabed disturbance. Santos has added an additional control measure (BB-CM-65) to ensure mooring equipment is subject to ongoing monitoring throughout operations, to ensure it remains in place to minimise seabed disturbance. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

| | |
|---|---|
| **Is the consequence ranked as I (Negligible) or II (Minor)** | Yes – maximum consequence from seabed and benthic habitat disturbance is II – Minor. |

The potential consequence of seabed disturbance on receptors is assessed as II – Minor. With the control measures in place, including compliance with industry standards and legislation, no significant impacts are expected. Flatback turtles will not be displaced from habitat considered critical for their survival under the *Recovery Plan for Marine Turtles in Australia 2017–2027* (Commonwealth of Australia, 2017). Therefore, the impacts of seabed disturbance to the receiving environment are ALARP and considered environmentally acceptable.

# 6.3 Light Emissions

## 6.3.1 Description of Event

| | |
|---|---|
| **Event** | Light emissions in the marine environment will occur as a result of:<br>• safety and navigational lighting on MODU activities<br>• safety and navigational lighting on vessel activities<br>• spot lighting during ROV activities<br>• flaring during well evaluation<br>MODU and vessels will typically use external lighting at night to ensure safe navigation and operations. This lighting, usually bright white (e.g. metal halide, halogen, fluorescent), is similar to that used in other offshore activities such as fishing and shipping.<br>The intensity of the lighting will be primarily dictated by operational safety and navigational requirements, in accordance with the *Navigation Act 2012*. |
| **Extent** | Limited light 'spill' or 'glow' on surface waters surrounding the MODU and support vessels.<br>Impacts expected to remain within the OAs. The amount of light produced from well testing is dependent on the characteristics of the reservoir and the flare flow rate. Flaring will be visible at distances of tens of kilometres.<br>The light assessment boundary of 20 km from the source is used as the extent of light exposure, in accordance with *National Light Pollution Guidelines for Wildlife* (DCCEEW, 2023a). |
| **Duration** | Navigational and safety lighting will be required on a 24-hour basis for the duration of the activity. Flaring is an intermittent source of light emission which if undertaken will last ~24–48 hours per well, over a period of 2–5 days. |

## 6.3.2 Nature and Scale of Environmental Impacts

**Potential receptors**: Threatened, migratory or local fauna (marine mammals, marine turtles, sharks, rays, fish, and seabirds), cultural receptors (totemic species).

This section evaluates the potential impacts of artificial light on listed species and other marine fauna known to be affected by light, including impacts on behaviour, survival, and/or reproduction, following the *National Light Pollution Guidelines for Wildlife* (DCCEEW, 2023a). In line with these guidelines, the EP has assessed the potential for light impacts within 20 km of the OAs (Commonwealth of Australia, 2023). This is considered conservative, based on observed impacts of sky glow on marine turtle hatchlings, which have been seen at distances of 15–18 km from the light source, and on fledgling seabirds, which have been grounded by artificial light from 15 km away. The potential for light glow to cause biological harm varies depending on factors like the number, intensity, spectral output, and positioning of the light sources. It's important to note that, for certain species and under specific environmental conditions, the impact of light glow can extend beyond 20 km (Commonwealth of Australia, 2023). The sensitivity of different species to different wavelengths is summarised in Figure 6-1, which shows that most species are sensitive to short wavelength light (ultraviolet/violet/blue).

Light is a form of energy emitted across a range of frequencies and wavelengths in the electromagnetic spectrum. The visible range for humans is typically 380–780 nm, with ultraviolet below and infrared above this range. Fauna, however, perceive light differently, with their visible spectrum varying between ~300 nm and over 700 nm, depending on the species (Commonwealth of Australia, 2023). This means potential impacts from artificial light depend on the light's characteristics (e.g. intensity, wavelength) and the species' sensitivity.

Santos commissioned a light modelling assessment for the Dorado OPP (including a development area located 15.5 km from the Mestrel/Bancroft OA, 40 km from the Wallace OA, 57 km from the Curie OA and 70 km from the Ara OA) (Pendoley Environmental, 2020), which involved modelling operational lighting from a facility (the FPSO) and routine flaring. This assessment is considered a suitable and conservative surrogate for the light emission from the drilling activity because:

- The deck lighting from an FPSO is in excess of that from a MODU during drilling
- The flaring tower height of the Dorado FPSO (110 m) is higher than the flare from a typical semi-submersible or jack-up MODU flare stack (~25-40 m).

Modelling of FPSO showed that the light radiance decreased to ambient levels (<0.01 full moon equivalent) at 17.7 km from the source. In the flaring scenario, the flare became no longer visible beyond 42.4 km, where it dropped below the horizon, with radiance at that distance equivalent to 0.25 full moons. As the flare drops below the horizon, radiance rapidly declined and is not visible. It is important to note that the flare tower modelled by Pendoley Environmental (2020) is much higher than the flare tower of a typical semi-submersible or jack up MODU and thus visible from a greater distance. Whilst this modelling is referenced in this section to inform the assessment

of impacts it is considered conservative for informing the distances of light from the drilling activities (including flaring), and where two MODUs operate simultaneously within separate OAs.

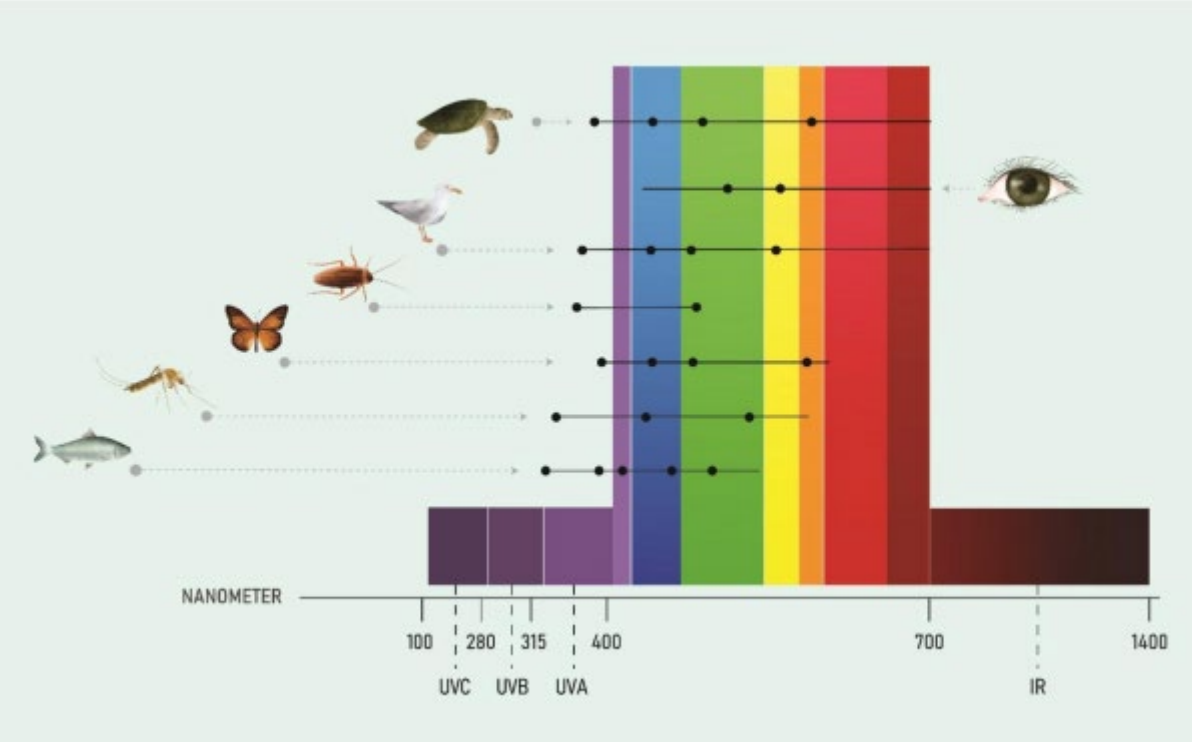



**Figure 6-1: Visibility of different wavelengths of light in humans and wildlife is shown by horizontal lines. Black dots represent reported peak sensitivity (Commonwealth of Australia, 2023).**

#### 6.3.2.1 Marine Mammals

There is a paucity of research investigating the effects of artificial lighting on marine mammals and direct effects of artificial lighting on cetaceans have not been reported. Many dolphin species are thought to be diurnal, or at least more active during the day, possibly related to prey availability (Sekiguchi and Kohshima, 2003). Since fish species may pool in areas of light spill, dolphins may be indirectly attracted to lit structures or illuminated marine environments for feeding purposes.

Mammals use variations in the length of day to anticipate environmental changes and time their reproduction. Marine mammals occurring in the area that may be affected by light will be transient, hence no impacts to biologically important behaviours will credibly occur. There is potential for opportunistic foraging for odontocetes should prey abundance be increased around light sources.

The humpback whale migration BIA (Figure 3-11) and pygmy blue whale migration BIA (Figure 3-10) are outside of the OAs but within the 20 km light assessment boundary. However, there are no reports of direct effects of artificial light on marine mammals and cetaceans and other marine mammals are not known to be significantly attracted to light sources at sea. Cetaceans predominantly use acoustic senses to monitor their environment rather than visual cues (Simmonds et al., 2004); therefore, impacts are thought to be unlikely.

#### 6.3.2.2 Marine Turtles

Marine turtles are particularly sensitive to artificial lighting, which can disrupt nesting females, newly emerged hatchlings, and hatchlings dispersing in nearshore waters (Salmon, 2003; Salmon et al., 1995a, 1995b; Salmon and Wyneken, 1987; Wilson et al., 2018). However, potential impacts on feeding turtles are limited, primarily due to secondary effects of light on prey distribution (Kebodeaux, 1994). Marine turtles do not feed during the breeding season (Limpus et al., 2013), and light does not influence their internesting behaviours. Internesting turtles are usually found in water depths of <30 m (Whittock et al., 2016), which is shallower than the OAs, where depths range from ~80–265 m (Thums et al., 2013).

*The Recovery Plan for Marine Turtles in Australia 2017–2027* (Commonwealth of Australia, 2017) identifies artificial light as a threat to marine turtles. The plan notes that artificial lighting can reduce overall reproductive success and hinder species recovery by:

- inhibiting nesting by females;
- disrupting hatchling orientation and sea-finding behaviour;
- creating light pools that attract swimming hatchlings and increase their risk of predation.

The most significant risk posed to marine turtles from artificial lighting is the potential disorientation of hatchlings following their emergence from nests by light spill on beaches, although breeding adult turtles can also be disoriented. This disruption can occur because hatchlings orient themselves to the lowest-elevation light horizon and away from high silhouettes when moving from the nest to the sea. Once turtle hatchlings reach the ocean, they rely primarily on directional cues from waves to orient themselves towards the open sea and the role of visual cues is thought to be lessened (Gomez Isaza et al. 2005). However, artificial light at night can disrupt the nearshore dispersal of turtle hatchlings, with miss-orientation rates ranging from 20–80%. (Gomez Isaza et al. 2025). Spending more time miss-orientated in nearshore waters can lead to fatigue in turtle hatchlings from swimming against currents and make them more vulnerable to predation and mortality from exhaustion. The Mestrel/Bancroft OA is the closest OA to a known turtle nesting location (~65 km from Bedout Island), whilst the remaining OAs are >100 km away from the nearest nesting habitat. Light from the activities will therefore not be directly visible from turtle nesting beaches, hence impacts to turtles during nesting and hatching will not occur.

The National Light Pollution Guidelines states that a 20 km buffer (based on sky glow) to important habitat for turtles should be applied when considering possible impacts (Commonwealth of Australia, 2023). However, the demonstrated impacts on which this buffer is based were in response to light emissions associated with a liquified natural gas (LNG) plant. Although details around the individual light sources of the case study and the light sources on the vessels are unknown, it is expected that light emissions associated with the MODU and vessels will be notably lower compared to an LNG plant. Given the OA is located >20 km away from the nearest turtle nesting beach, light emissions will not be visible and any impacts (including cumulative impacts) with respect to hatchling emergence are not expected). Even in an eventuality that a flare light is visible at ~42 km from the source (as per the Dorado development light modelling) the light will not be visible from the nearest turtle nesting beaches.

Whilst the Mestrel/Bancroft OA is directly adjacent to the reproduction (internesting buffer) BIA for flatback turtles (Figure 3-17), based on tagging studies and depth observations (Whittock et al. 2016; Thums et al. 2018), it is unlikely that significant numbers of internesting flatback turtles would be present within the OAs given the water depths (80–265 m); in addition the nearest marine turtle nesting sites are located ~65 km away from the Mestrel/Bancroft OA. It is therefore reasonable to assume that impacts to biologically important behaviours will not credibly occur.

Experienced nesting females are unlikely to be disturbed by light, but first-time nesters may be disturbed by light when they are selecting their first nesting beach (Pendoley, 2014). Given that the closest nesting beach is ~65 km from the Mestrel/Bancroft OA and >100 km from the remaining OAs, nesting females should not be disorientated by light emissions. Furthermore, once in the water, turtle hatchlings orientate by wave fronts and do not appear to rely on visual cues (Pendoley, 2014), therefore light emissions are unlikely cause disorientation at that distance (i.e. >20 km). Foraging turtles are adults and not considered as significantly impacted by lighting as hatchlings (refer below).

Given the distance of the OAs to nesting beaches and the predicted range at which light emissions will be observable, no impacts to emergent hatchlings and nesting females are expected. Impacts from light emissions on individual turtles in the area that may be affected by light emissions during the activities are expected to be restricted to localised attraction and temporary disorientation. These impacts are short-term (i.e. during the activity), will not result in population-scale impacts or long-term threats to the survival of marine turtles, and are considered to be negligible. Light emissions from the activity will not compromise the objectives as set out in the marine turtle recovery plan; flatback turtles will not be displaced from habitat critical for their survival.

#### 6.3.2.3 Sharks, Fish and Rays

Fish at the surface of the water have the potential to be impacted by artificial light. The response of fish to light emissions varies according to species and habitat. Experiments using light traps have found that some fish and zooplankton species are attracted to light sources (Meekan et al., 2001), with traps drawing catches from up to 90 m away (Milicich, 1992). Lindquist et al. (2005) concluded from a study that artificial lighting associated with offshore oil and gas activities resulted in an increased abundance of clupeids (herring and sardines) and engraulids (anchovies). These species are known to be highly photopositive. The artificial light serves to focus their marine plankton prey and consequently leads to enhanced foraging success for planktivorous fishes. It may also lead to higher rates of predation on planktivorous fishes by predators.

The OAs overlap the whale shark foraging BIA (Figure 3-9) and therefore artificial light from the activities could attract foraging whale sharks within 90 m of the activities and affect vertical migration. However, given the short duration of the activities these impacts are not expected to be significant. Furthermore, light from the activities will not extend as far as the whale shark foraging (high density prey) BIA where higher numbers of whale sharks are expected.

Overall, a short-term, localised change in fish behaviour is expected to occur as a result of lighting from the activities. However, this will result in negligible impacts to fish assemblages and sharks (including whale sharks) at a regional scale.

#### 6.3.2.4 Birds (seabirds/shorebirds)

Artificial lighting can attract and disorient seabirds, leading to changes in behaviour (e.g. circling around light sources or disrupted foraging), as well as potential injury or mortality near the light (Gaston et al., 2014; Longcore and Rich, 2004). Studies conducted in the North Sea between 1992 and 2002 demonstrated that artificial light caused birds to gather around illuminated offshore structures (Marquenie et al., 2008). Birds may either be attracted by the light source itself or indirectly as structures in deep water environments tend to attract marine life at all tropic levels, creating food sources and providing artificial shelter for seabirds. The most vulnerable life stages for seabirds and migratory shorebirds are nesting adults or fledglings. As the OAs are offshore and away from islands or other emergent features and does not host any permanent infrastructure above the sea, any presence of seabirds or shorebirds is considered likely to be of a transient nature only, such as migrating or foraging.

The most vulnerable stages for seabirds and migratory shorebirds are nesting adults and fledglings. Given that the OAs are offshore, away from islands or other land features, and lacks permanent infrastructure above the sea, any seabird or shorebird presence is likely to be transient, such as during migration or foraging. The OAs overlap with the white-tailed tropicbird, lesser frigatebird, and brown booby reproduction BIAs (Table 3-10). Additionally, the 20 km light assessment boundary overlaps with the wedge-tailed shearwater reproduction BIA. The Mestrel/Bancroft OA is located ~65 km from the nearest sensitivity (Bedout Island) at its closest, that provides seabird roosting or breeding habitat, other OAs are located in excess of this distance. As this is outside the 20 km buffer suggested by the National Light Pollution Guidelines, breeding behaviour is not expected to be interrupted, with individual seabird species expected to overfly the location.

Diurnal seabird species, such as terns, noddies, and boobies, are generally less affected by nocturnal lighting than procellariforms. Terns, boobies, and the lesser frigatebird nest in large numbers at Bedout Island (Burbidge et al., 1987) (65 km from Mestrel/Bancroft OA). While there are no specific reports of interactions between these species and offshore facilities, Tasker et al. (1986) observed various seabird species feeding by the light of gas flares at night, a behaviour less common during the day. Ortego (1978) also reported increased foraging by blue-faced boobies due to artificial light from an oil rig in the Gulf of Mexico.

There is limited research on how diurnal seabirds respond to different wavelengths of light. Studies on gulls and terns have shown that some species possess visual pigments for short-wavelength ultraviolet and blue light, but this is not universal (Machovsky-Capuska et al., 2011). Tagging studies of wedge-tailed shearwaters by Cannell et al. (2019) indicated that most foraging activity occurred around nesting islands. However, tagged birds were also observed foraging widely in the Indian Ocean.

Seabirds may be temporarily attracted to light from the activities, or fauna aggregated by light. This behavioural disturbance to is expected to be localised to within the vicinity of the MODU and vessels within the OAs. The light source from the activities will be temporary, therefore any impacts are predicted to be at an individual level and not a population level. The temporary behavioural disturbance of birds will be localised around the light sources and not result in a substantial adverse effect on a population of species or its lifecycle. 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 shorebirds attracted to the light is considered to be low, based on the short-term duration and localised nature of the activities, as well as the distance offshore. Impacts are expected to be limited to temporary behavioural disturbance to isolated individuals, not expected to disrupt migration of seabirds.

#### 6.3.2.5 Cultural Receptors

Totemic species of cultural value may pass through the OAs; however, during consultation, Santos was not made aware of any other cultural receptors within the OAs. Light impacts to marine species and seabirds have been considered above.

#### 6.3.2.6 Cumulative Impacts

The combined presence of two MODUs and support vessels operating concurrently in separate OAs may result in slightly elevated ambient light levels; however, any cumulative impacts would be limited and temporary in nature given the short duration of the activity. While this may increase sky glow, it is not expected to be visible from nearest turtle nesting beach (~65 km away). Although flaring may be visible up to 42 km, no additional impacts from flaring are expected from the combined presence of two MODUS in separate OAs, as they are unlikely to conduct flaring at the same time, flaring will be conducted intermittently for 24–48 hours per well, over a period of 2–5 days and may not be conducted on every well.

### 6.3.3 Environmental Performance Outcomes and Control Measures

The EPO relating to this event is:

- Reduce impacts to marine fauna from lighting on vessels and MODU through limiting lighting to that required by safety and navigational lighting requirements [BB-EPO-04]

The CMs considered for this activity are shown in Table 6-4, with EPSs and measurement criteria for the EPOs described in Table 8-2.

**Table 6-4: Control measures evaluation for light emissions**

| CM Reference No. | Control Measure | Hierarchy Control Level | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-07 | Lighting will be used as required for safe work conditions and navigational purposes only. | Engineering | Reduces the risk of collisions with other marine users.<br>Reduces risk of environmental impact from vessel collisions due to ensuring maritime safety requirements are fulfilled.<br>Marine Order Part 30: Prevention of Collisions, and with Marine Order Part 21:<br>Safety of Navigation and Emergency Procedures requires vessels to have navigational equipment to avoid collisions<br>Would result in reduced light spill from internal lighting onto the sea surface, potentially reduce overall light emissions, and reduce the consequence of any seabird interactions. | Cost associated with training MODU and vessel staff to minimise lighting. | **Adopted**<br>Cost is considered acceptable for the benefit that may be realised from this control.<br>This is maritime requirement. |
| **Additional Control Measures** | | | | | |
| N/A | Manage the timing of the activity to avoid sensitive periods at the location (e.g. turtle nesting/hatching, seabird reproduction) | Eliminate | Reduce risk of impacts from light emissions during environmentally sensitive periods for listed marine fauna (e.g. turtle nesting/hatching, seabird reproduction). | High cost in moving or delaying activity schedule for operational reasons (schedule dependent on availability vessel(s) and MODU and well sequence). The risk to all listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable | **Not adopted**<br>Given the minimal risk of impacts to listed marine species (e.g. turtles) occurring due to lighting, the financial and environmental costs of extending the activity duration are deemed grossly disproportionate to low environmental benefits. The nearest known turtle nesting beach and shoreline |

| CM Reference No. | Control Measure | Hierarchy Control Level | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | presence of some species. | supporting seabird reproduction (Bedout Island) is ~65 km from the closest OA (Mestrel/Bancroft). Impacts are not expected on a population level or to impact on turtle habitat or seabird habitat. |
| N/A | Review lighting to a type (colour) that has less impact, that has less impact, in accordance with the National Light Pollution Guidelines. | Substitute | Could reduce potential impacts of artificial light on certain fauna. | High cost to complete lighting change out on MODU and vessels in area of low sensitivity. Navigational lighting colours are stipulated by law. | **Not adopted**<br>Cost outweighs the benefit. The nearest known turtle nesting beach and shoreline supporting seabird reproduction (Bedout Island) is ~65 km from the closest OA (Mestrel/Bancroft). Although the operational area overlaps with foraging turtle BIAs, impacts are not expected on a population level or to impact on turtle or seabird habitat.<br>Changes to safety code/requirements is not commensurate with minimising environmental risk. |
| N/A | Limit or exclude night-time operations. | Eliminate | Would eliminate potential impacts of artificial light during hours of darkness when light sources are more apparent and potential impacts are greatest. | Would double duration of activity; increase impacts or potential impacts in other areas, including increase in waste, air emissions, risk of vessel collision etc. A minimal level of artificial lighting will still be required on-board the MODU and vessels on a 24-hour basis for safety reasons. | **Not adopted**<br>Given the minimal risk of impacts to turtles occurring, the financial and environmental costs by requiring all works to be undertaken during daylight hours only are not considered appropriate given the extended duration of the activity that would occur. |
| N/A | Use of dark, matte surfaces on MODU and vessels to reduce sky glow. | Substitute | Reduce potential for impacts on turtles from light emissions during hours of darkness when light sources are more apparent and | Additional cost to repaint vessel surfaces | **Not adopted**<br>Given the distances from the nesting beaches (>60 km) from the OAs retrofitting dark, matte surfaces to |

| CM Reference No. | Control Measure | Hierarchy Control Level | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | potential impacts are greatest. | | vessels and MODU or only selecting vessels and MODU with is modification is considered disproportionate. Changes not commensurate with risk. |
| N/A | No flaring during well evaluation. | Elimination | Eliminates light emissions from flaring. | Not considered feasible. Flaring is required to ascertain the pressure, flow characteristics and composition of the reservoir fluids if encountered. Not flaring would present uncertainty in planning future activities. | **Not adopted**<br>Flaring is required to ascertain the pressure, flow characteristics and composition of the reservoir fluids if encountered. Flaring assists in determining future activities and is of short duration (24–48 hours). |
| N/A | Implement light management actions recommended in the National Light Pollution Guidelines, including:<br>• Switch off outdoor/deck lights when not in use<br>• Use available block-out blinds on portholes and windows not necessary for safety and/or navigation at night<br>• Manage and report seabird interactions. | Administrative | Would result in reduced light spill from internal lighting onto the sea surface, potentially reduce overall light emissions, and reduce the consequence of any seabird interactions. | Cost of maintaining records and to train staff. Potential re-engineering of vessel (lighting management systems and blackout blinds). | **Not adopted**<br>Control considered irrelevant considering the operational areas are not located in an area that is identified within the Guidelines as likely to cause impact to turtle nesting or hatching, or seabird breeding (>65 km away from the nearest turtle nesting beach and shoreline supporting seabird reproduction), and therefore would not change the potential environmental impacts.<br>24 hours/day drilling activities require a safe standard of lighting. |

### 6.3.4 Environmental Impact Assessment

| Receptor | Consequence Level |
|---|---|
| **Light Emissions** | |
| Threatened, migratory or local fauna | Continuous lighting in the same location for an extended period of time may result in alterations to normal marine fauna behaviour. Sensitive receptors that may be impacted by light emissions include marine mammals, turtles, fish, sharks, and seabirds. |

| Receptor | Consequence Level |
|---|---|
| | Light pollution is identified as a potential threat to marine turtles in *the Marine Turtle Recovery Plan for Australia* (Commonwealth of Australia, 2017). While light emissions might be visible to turtles in transit or whilst foraging, they are unlikely to impact nesting or hatchling dispersal given the distances from the OAs to nesting sites (~65 km). It is considered that the activity will not compromise the objectives as set out in the marine turtle recovery plan, flatback turtles will not be displaced from habitat critical for their survival and therefore, the impact of lighting associated with the activity to turtles is negligible.<br>The OAs overlap with the white-tailed tropicbird, lesser frigatebird and brown booby reproduction BIAs (see Table 3-10). Additionally, the 20 km light assessment boundary overlaps with the wedge-tailed shearwater reproduction BIA. The Mestrel/Bancroft OA is located ~65 km from the nearest sensitivity (Bedout Island) at its closest point, that provides significant seabird roosting or breeding habitat, other OAs are located in excess of this distance. As this is outside the 20 km buffer suggested by the National Light Pollution Guidelines, breeding behaviour is not expected to be interrupted, with individual seabirds expected to overfly the location. Young fledglings, which are more susceptible to disorientation from artificial light, have been known to be affected by lights up to 15 km away. If their nesting habitat remains constantly lit, fledglings may not take their first flight (DCCEEW, 2023a). Foraging and breeding in the OAs are expected to occur at low densities during the breeding season.<br>There is limited evidence that marine mammals are significantly attracted to artificial light sources at sea; therefore, behavioural disturbance is considered unlikely and indirect impacts on food sources or habitats are also unlikely (Marangoni et al. 2022). Fish and sharks have been shown to be attracted to artificial light sources however, the activity is unlikely to lead to changes in species abundance or distribution.<br>Impacts to transient fish and sharks will therefore be limited to short-term behavioural effects with no decrease in local population size or area of occupancy of species, loss or disruption of critical habitat, or disruption to the breeding cycle.<br>Where two MODUs and support vessels operate concurrently within separate OAs, ambient lighting may be slightly elevated. However, this is temporary and is not expected to be visible from the nearest turtle nesting beach (~65 km away). Additionally, flaring will only occur intermittently for a duration of 2–5 days per well and may not be required for every well.<br>With management controls in place and considering the distance from shorelines, the artificial lighting associated with the activity is expected to have minor impacts on fauna, including seabird and marine turtle populations.<br>Therefore, potential impacts are considered to be Minor (II). |
| Physical environment or habitat | Impacts to physical environment and/habitats from light emissions will be negligible and will not lead to any reduction in physical environment/habitat. |
| Threatened ecological communities | Not applicable – No threatened ecological communities identified in the area over which light emissions are expected. |
| Protected areas | Not applicable – No protected areas are identified in the area over which light emissions are expected. |
| Socio-economic receptors | Not applicable – Lighting is not expected to cause an impact to socio- economic receptors other than to act as a visual cue for avoidance of the area by other marine users for safety purposes.<br>EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. Impacts to totemic species have been addressed under local fauna. |
| Overall worst-case consequence | I- Negligible |

### 6.3.5 Demonstration of As Low as Reasonably Practicable

Artificial lighting will be required on a continuous 24-hour basis during the activity, to maintain safe working conditions and navigational safety standards. Lighting levels will be minimised to the extent possible without compromising operational safety. Standard controls adopted include the use of lighting for safe work conditions and navigational purposes only, consistent with relevant industry and maritime standards. MODU and vessel crews will be trained to minimise unnecessary lighting, reducing light spill and associated impacts while maintaining compliance with safety requirements. The costs associated with these standard controls, such as staff training, are considered acceptable given the operational benefits and minor environmental improvements achieved.

Additional control measures were evaluated (Table 6-4) but were not adopted as their cost, complexity, or operational impacts were grossly disproportionate to the minor environmental benefit that could be gained. Managing the timing of activities to avoid sensitive marine fauna periods, or limiting night-time operations, was not

adopted because it would significantly extend the duration of activities, thereby increasing emissions, discharges, and the period of potential marine user exclusion without net environmental benefit (the nearest known turtle nesting beach [Bedout Island] is ~65 km from the closest OA – Mestrel/Bancroft]). Changing lighting types or colours to alternatives recommended in the National Light Pollution Guidelines was also not adopted, as navigational lighting is prescribed by law and retrofitting a MODU and vessels operating far from sensitive habitats would involve disproportionate cost for minimal benefit.

The use of dark, matte surfaces on vessels and MODU to reduce sky glow was considered but not adopted for similar reasons, as was ceasing flaring during well evaluation. Flaring is essential for confirming reservoir characteristics and occurs over a very short duration (24–48 hours per well over a period of 2–5 days).

Implementing additional light management actions, such as blackout blinds or switching off deck lighting when not required for navigation or safety, was also not adopted, as the OAs are located far from any critical habitats for marine turtles or seabirds, and the measures would not materially change the risk profile.

Lighting from the activities will not compromise the objectives outlined in the *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017), the *Wildlife Conservation Plan for Seabirds* (Commonwealth of Australia, 2020a), or the *National Light Pollution Guidelines for Wildlife* (DCCEEW, 2023a). The short duration of the activity and the implemented controls will ensure that nesting adults, foraging individuals, and emerging or dispersing hatchlings are not adversely affected.

All practical control measures have been reviewed (Section 6.3.3), and those adopted, as detailed in Table 6-4, are considered appropriate to manage the impacts such that the residual consequence is assessed to be I – Negligible and cannot be reduced further. The proposed management controls for light emissions are in accordance with the Santos' risk management criteria and are considered appropriate to manage the risk to ALARP.

### 6.3.6 Acceptability Evaluation

| | |
|---|---|
| **Is the consequence ranked as I or II?** | Yes – maximum consequence from light emissions is II-Minor |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ESD.<br>The consequence against this aspect is II (Minor) and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – management consistent with *International Convention of the Safety of Life at Sea (SOLAS) 1974* and the *Navigation Act 2012*.<br>Relevant species recovery plans, conservation management plans and management actions, including but not limited to the:<br>• *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017)<br>• *North-west Marine Parks Network Management Plan* (Director of National Parks, 2018)<br>• *Blue Whale Conservation Management Plan 2015 to 2025* (Department of Agriculture, Water and the Environment, 2021)<br>• *Conservation Advice for Megaptera novaeangliae* (humpback whale) (TSSC, 2015a)<br>• *National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds* (DCCEEW, 2023a)<br>• *Wildlife Conservation Plan for Seabirds* (Commonwealth of Australia, 2020) |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | During the public comment period, comment was raised regarding lighting impacts. These matters are addressed in Section 6.3.5. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP. |

The lighting on the MODU and vessels complies with industry standards and is necessary to meet relevant maritime and safety regulations. The potential impacts of these artificial light sources within the OAs are considered

insignificant, limited to short-term behavioural effects on individual fauna present during the activity. No stakeholder concerns have been raised regarding lighting for the activities.

Stakeholder feedback relating to lighting impacts on turtles have been addressed.

The *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017) highlights priority actions for the Pilbara genetic stock of flatback turtles and the NWS genetic stock of green turtles, specifically related to light pollution. It states that artificial light within or near critical habitat must be managed to ensure that marine turtles are not displaced from these areas. Although the Mestrel/Bancroft OA is directly adjacent to the flatback turtle reproduction (internesting buffer) BIA, aggregating marine turtle adults are unlikely to be present due to the deeper water depths in all OAs (ranging from ~80–265 m).

The potential consequence of light emissions on receptors is assessed as I – Negligible. With the control measures in place, including lighting management procedures and compliance with navigational safety legislation, no significant impacts are expected. Therefore, the impacts of light emissions to the receiving environment are ALARP and considered environmentally acceptable.

## 6.4 Noise Emissions

### 6.4.1 Description of Event

| | |
|---|---|
| **Event** | Potential impacts from noise emissions may occur during the activities.<br>Noise emissions in the OAs during activities will be produced from the following sources:<br>• MODU activities (e.g. drilling, well construction and machinery, flaring).<br>• Vessel activities (e.g. vessel engines, thrusters and other machinery).<br>• Helicopter activities.<br>• ROV or AUV operations.<br>• Positioning equipment (e.g. USBL, LBL).<br>• Survey equipment (e.g. MBES, SSS, SBP).<br>• Internal VAP inside the well bore. |
| **Extent** | Impacts from potential noise sources will only occur during the activities and will be concentrated around the above-mentioned sources. The relative extent of various noise sources are as follows:<br>• Approximately 2.4 km from the VAP activities.<br>• Approximately 3–4 km from a vessel using main engines and bow thrusters to maintain position and the MODU undertaking drilling. Underwater noise from flaring will be limited to two to five days per well test and is not expected to exceed vessel/MODU operational noise levels.<br>• Noise from other sources will be of relatively low intensity.<br>The extent of underwater noise in regard to various marine fauna response thresholds is described further below.<br>Cumulative or additive noise impacts from the activity are not expected including in the event that two MODUs drill concurrently within separate OAs. Whilst two MODUs and associated vessels operating at the same time would increase the overall underwater noise footprint, short-term nature of the activities in each OA, the low sound levels generated by continuous noise sources and the short duration of VAP mean that cumulative impacts are expected to be negligible. There is no potential for additive or cumulative impacts with other operators as consultation did not identify any concurrent activities. |
| **Duration** | Continuous MODU and vessel noise emissions for the duration of the Activity, with intermittent emissions associated with discrete activities, (e.g. flaring, helicopter arrivals, etc). Drilling of each well is expected to take ~40–110 days per well.<br>Impulsive noise emissions during use of positioning equipment (LBL, USBL and MBES) will be used periodically for the full duration of each well.<br>Noise from flaring will be limited to two to five days per well test. |

Terms used in this noise emissions assessment are defined in Table 6-5.

**Table 6-5:Terms used in this underwater noise assessment**

| Terms | Definition |
|---|---|
| Acoustic noise | Sound that interferes with an acoustic process. |
| Auditory injury (Aud Inj) | Damage to the inner ear that can result in the destruction of tissue, such as the loss of cochlear neuron synapses or auditory neuropathy. Auditory injury may or may not result in a permanent threshold shift (PTS) (NMFS, 2024). |

| Terms | Definition |
|---|---|
| Behavioural response | A behavioural response or disturbance in a species from sound pressure. Behavioural response will depend on the audible frequency range of each potential receptor in relation to the frequency of the noise (as species will only respond to acoustic signals they can detect), as well as the intensity of the noise. |
| Continuous sound | A sound whose sound pressure level remains above the background noise during the observation period and may gradually vary in intensity with time, e.g. sound from a marine vessel. |
| Decibel (dB) | Unit of level used to express the ratio of one value of a power quantity to another on a logarithmic scale. Especially suited to quantify variables with a large dynamic range. |
| Ensonified | Exposed to sound. |
| Hearing threshold | For a given species or functional hearing group, the sound level for a given signal that is barely audible (i.e. that would be barely audible for a given individual in the presence of specified background noise during a specific percentage of experimental trials). |
| Impulsive sound | Qualitative term meaning sounds that are typically transient, brief (<1 s), broadband, with rapid rise time and rapid decay. They can occur in repetition or as a single event. Sources of impulsive sound include, among others, explosives, airguns, and impact pile drivers. |
| Masking | Obscuring of sounds of interest by other sounds at similar frequencies. |
| Peak sound pressure level (PK), zero-to-peak sound pressure level | The level (Lpk) of the squared maximum magnitude of the sound pressure () in a stated frequency band and time window. Defined as Lpk = 10 $\log_{10}$() = 20 $\log_{10}$(ppk/p0). Unit: decibel (dB). Reference value () for sound in water: 1 $\mu Pa^2$. |
| Permanent threshold shift (PTS) | An irreversible loss of hearing sensitivity caused by excessive noise exposure. Considered auditory injury. Compare with temporary threshold shift. |
| Sound exposure level (SEL) | The level (LE) of the sound exposure (E) in a stated frequency band and time window:<br>LE = 10 $\log_{10}$(E/E0) (ISO 18405:2017).<br>Unit: decibel (dB). Reference value (E0) for sound in water: 1 $\mu Pa^2$ s. |
| Sound pressure level (SPL), rms sound pressure level | The level (Lp) of the time-mean-square sound pressure in a stated frequency band and time window: Lp = 10 $\log_{10}$( ) = 20 $\log_{10}$(prms/p0), where rms is the abbreviation for root-mean-square. Unit: decibel (dB). Reference value for sound in water: 1 $\mu Pa^2$. SPL can also be expressed in terms of the root-mean-square (rms) with a reference value of p0 = 1 µPa. The two definitions are equivalent. |
| Source level (SL) | A property of a sound source equal to the sound pressure level measured in the far field plus the propagation loss from the acoustic centre of the source to the receiver position. Unit: decibel (dB). Reference value: 1 $\mu Pa^2$ $m^2$. |
| Temporary threshold shift (TTS) | Reversible loss of hearing sensitivity caused by noise exposure. |

#### 6.4.1.1 Noise generated by MODU activities

The MODU will be a semi-submersible moored rig or jack-up (see Section 2.2.1), neither of which will emit DP noise. The MODU will generate continuous noise from the operation of on-board machinery, such as diesel engines, pump, ventilation fans (and associated exhaust) and electrical generators. These noise sources all occur above the water, however the MODU hull ((if semi-submersible) may transmit some of this noise into the sea. These sources account for most of the acoustic emissions to sea during drilling, with the drill string transmitting relatively little noise (Austin et al., 2018a).

Sound produced from an active moored semi-submersible MODU is predominantly <2 kHz, with peak frequencies <500 Hz. McCauley (1998) recorded source noise levels for moored MODUs from 149–154 dB re 1 µPa at 1 m while actively drilling (with support vessel on anchor). There was a significant variation in the broadband noise during non-drilling periods, attributed to the operation of specific types of machinery. Greene (1987) recorded source levels of two moored drill ships from 145–158 dB re 1 µPa at 1 m during drilling (with support vessels idling nearby).

An acoustic monitoring program commissioned by Santos was conducted during an exploratory drilling program in 2003, which indicated that the drilling operation was not audible from between 8 km to 28 km from the MODU (or beyond) (McCauley, 2005). Austin et al. (2018a) recorded broadband source levels from MODU operations (excluding DP thrusters) to be 170.7 dB re 1 µPa. Studies undertaken in the Arctic on different MODU types (including semi-submersible and drill ships) indicate that noise levels dropped to 117 dB re 1 µPa within 1 km of the MODU and are much lower than those for large commercial vessels operating at normal speeds (Austin et al.,

2018b). Hence source levels from the MODU are reasonably assumed to be <170.7 dB re 1 µPa, concentrated below 2 kHz and reduce rapidly with distance from the MODU.

In general, jack-up MODUs transmit less noise underwater than a semi-submersible MODU or a drill vessel due to a smaller surface area being in contact with the water column. Sound produced by jack-up MODU during drilling are typically 16–200 kHz frequencies with a source level range of 167–171dB re 1µPa @ 1 m (MMO, 2015).

Flaring will generate noise from combustion. Noise from flaring is emitted at the top of the flare tower, which is >100 m above sea level. Noise from the tip of the flare is not constrained and spreads spherically in all directions. Received levels from airborne propagation modelling were used to ascertain the underwater received levels during flaring activities for a drilling and subsea installation activity (Woodside, 2019). Only a very small fraction of the acoustic energy produced from flaring will transmit through the air/water boundary due to the surface of water acting as a reflective plane and a significant component of acoustic energy reflecting back into the air. While underwater received sound pressure level during flaring is estimated to be 136 dB re 1µPa at 1 m (SPL) below the sea surface it is estimated to attenuate to ambient levels within a very short distance (e.g. metres) (Woodside 2024) and therefore is not considered further in the impact assessment.

#### 6.4.1.2 Noise generated by vessels

Vessels produce low frequency sound (i.e. <1 kHz) from the operation of machinery, hydrodynamic flow sound around the hull and from propeller cavitation, which is typically the dominant source of sound (Jiménez-Arranz et al., 2020). Machinery on vessels radiates sound through the hull into the water. Sound emitted from support vessels differs significantly depending on factors such as speed, size, load, type and state of propulsion system, and meteorological and oceanographic conditions, such as sea surface and currents (MacGillivray, 2018). A reasonable representation of vessel noise during the activity is a vessel under slow transit.

McCauley (1998) measured underwater broadband noise equivalent to about 182 dB re 1 µPa at 1 m (RMS SPL) with a frequency range of 20 Hz to 10 kHz from a support vessel holding station in the Timor Sea; it is expected that similar noise levels will be generated by support vessels used during the activities. The thruster noise dropped below 120 dB re 1 µPa within 3–4 km and was audible above ambient noise up to 20 km away (McCauley, 1998). This has been taken as the greatest noise generating activity for assessment purposes, as other vessel activities will require the vessel to be idle or moving. McCauley (1998) measured underwater a 64 m long support vessel with 8,000 HP (6,000 kW) main engines during calm conditions in the Timor Sea in 110 m of water while transiting at 11 knots and found the distance to 120 dB re 1 µPa to be ~1 km (i.e. substantially less than when the vessel was holding station using DP).

#### 6.4.1.3 Noise generated by helicopters

Helicopters are expected to land/take off from the MODU several days a week (see Section 2.2.3). It is expected that underwater noise resulting from helicopter activity will only be detectable in the upper water column for very brief periods during landing and take-off. Sound traveling from a source in the air (e.g. a helicopter) to a receiver underwater is affected by both in air and underwater propagation processes, and processes occurring at the air seawater surface interface (e.g. wind and waves). The level of noise received underwater depends on source altitude and lateral distance, receiver depth, water depth, and other variables.

Helicopter engine noise is emitted at various frequencies however, the dominant tones are typically low frequency and below 500 Hz (Richardson et al., 1995). The sea surface is an effective reflector of sound energy and much of the in-air noise from a helicopter will be reflected by the sea surface, with a relatively small portion being transmitted into the sea. The noise from the flyover of a Bell 214 helicopter (stated to be one of the noisiest) has been recorded underwater and the sound source was 162 dB re 1 µPa @ 1 m at its peak and had frequency of 155 Hz (Richardson et al., 1995).

Although helicopters are expected to land/take-off from the MODU several days per week, the duration of helicopter operation within close proximity to the marine environment is limited and intermittent. Further helicopter operations are expected to result in received underwater noise levels lower than those associated with vessel operations.

#### 6.4.1.4 Noise generated by survey equipment

Surveys may be undertaken prior to the MODU arrival (see Section 2.3). The data will be used to inform the positioning of a jack-up MODU. The geophysical survey methods (Section 2.3.1) are non-intrusive, and the equipment does not disturb the seabed. Geotechnical survey methods (Section 2.3.3) may disturb the seabed, however, do not carry significant sound sources.

Geophysical survey methods may include multibeam echo sounder (MBES), sub-bottom profiler (SBP), side-scan sonar (SSS), ROV-mounted equipment (such as video, altimeter, and obstacle avoidance sonar) and magnetometer. The noise from this equipment is categorised as impulsive noise and defined by a series of pulsed sound events that are brief, broadband, atonal and transient.

- MBES uses sound pulses to establish the seabed profile. Most modern MBES systems work by transmitting a broad acoustic pulse from a hull, pole or ROV-mounted transducer.
- SBP determines the seafloor subsurface characteristics and composition using acoustics pulses transmitted from a towed surface or deep-sea source.
- SSS detects debris and other obstructions on the seafloor using a towed transducer that transmits high-frequency acoustic pulses.
- the magnetometer survey uses magnetic induction to identify the presence of iron (e.g. wrecks and unexploded ordnance) on the seabed from a towed surface or deep-sea source.
- ROV-mounted obstacle avoidance sonar provides depth indications and object imaging to aid in navigation using sound waves. ROV-mounted altimeter measures an object's depth using depth or pressure sensors.

Estimated frequency and sound ranges for geophysical survey equipment is presented in Table 6-6.

**Table 6-6: Estimated frequency and sound ranges for geophysical survey equipment**

| Geophysical technique | Estimated source intensity (peak dB re 1µPa @ 1 m) | Estimated source level (rms dB re 1µPa @ 1 m) | Estimated SEL (dB re 1µPa2s) | Frequency range (kHz) |
|---|---|---|---|---|
| MBES | 210–245 | 221 | 188 | 150–700 |
| SSS | 200–235 | 234 | 200 | 75–500 |
| SBP | 170–230 | 210 | 193 | 2–23 |

*Source: Jimenez-Arranz et al., 2017.*

An array of long baseline (LBL) and/or ultra-short baseline (USBL) transponders may be installed on the seabed for metrology and positioning. Transponders typically emit pulses (impulsive noise) of medium frequency sound, generally within the range 21–31 kHz. The estimated SPL would be 180–206 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 3–40 milliseconds. Transponders will not emit any sound when on standby. When required for general positioning they will emit one chirp every five seconds.

#### 6.4.1.5 Noise generated by VAP

Hydrocarbon bearing formations identified during drilling may be evaluated using wireline logging tools and VAP prior to completion of the activity. If this is the case, VAP will be carried out using geophones (receivers) positioned at different levels inside the wellbore and an acoustic source near the ocean surface. The acoustic source is typically a three 250 cubic inch air gun configuration deployed ~5 m below the water surface from the MODU, or potentially a support vessel. In addition to tying well data to acoustic data, the VAP also enables the conversion of acoustic data to zero-phase data and distinguishes primary reflections from multiples. VAP typically takes approximately 12 hours, with approximately ~130 shots in total, and is undertaken at the completion of drilling. VAP generates higher intensity noise than routine drilling operations. Modelling of a VAP sound source (JASCO, 2020) for the Santos Dorado development estimated that the maximum distance to the SPL threshold of 160 dB re 1 µPa was 2.42 km from the centre of the VAP array.**Noise generated by ROV operations**

ROVs/AUVs may be used for a variety of activities including, but not limited to survey activities, inspections of the seabed and/or retrieving dropped objects. Noise generated from an ROV will typically be of considerably lower intensity than vessel noise. ROVs are often fitted with equipment including, but not limited to cutters, cameras and tools. Some of this equipment could emit pulses of noise, such as sonar equipment.

As underwater sound levels are dependent on the primary (noisiest) sound source rather than being strictly additive, and since ROV operations will be in addition to vessel and MODU operations, they will make little contribution to the overall noise emissions associated with other activities, as described above and are not risk assessed further.

### 6.4.2 Nature and Scale of Environmental Impacts

**Potential Receptors**: Threatened or migratory fauna (marine mammals, marine turtles, sharks, fish and rays) cultural receptors (totemic species).

Marine fauna use sound for a variety of functions including social interactions, foraging, orientation and responding to predators. Underwater noise may impact on marine fauna through:

- attraction to the noise source
- increased stress level
- disruption to underwater acoustic cues

- localised avoidance
- disturbance, leading to behavioural changes or displacement from areas
- masking or interference with other biologically important sounds such as communication or echolocation;
- physical injury to hearing or other organs
- indirectly by inducing behavioural and physiological changes in predator or prey species.

The nature and scale of impacts must be considered in the context of the ambient noise environment. Ambient underwater noise levels are dependent on location, and are often dominated by local wind noise, waves, biological noise and ship traffic. Wind speed and seabed conditions have a clear influence on the ambient noise level. Existing anthropogenic underwater noise sources in the region of the proposed activity include shipping, small vessel traffic, and petroleum-production activities.

Responses of marine fauna exposed to underwater noise from anthropogenic sources may vary. Responses depend on many factors, such as sound source characteristics, distance from the sound source, water depth and bathymetry, the animal's hearing sensitivity, type and duration of sound exposure and the animal's activity at time of exposure.

The effects of sound on marine fauna can be broadly categorised as:

- acoustic masking – anthropogenic sounds may interfere with, or mask, biological signals, therefore reducing the communication and perceptual space of an individual. Auditory masking impacts may occur when there is a reduction in audibility for one sound (signal) caused by the presence of another sound (noise). For this to occur the noise must be loud enough and have a similar frequency to the signal and both signal and noise must occur at the same time.
- behavioural response – behavioural impacts will depend on the audible frequency range of each potential receptor in relation to the frequency of the noise, as marine animals will only respond to acoustic signals they can detect, as well as the intensity of the noise. The intensity of behavioural responses of marine mammals to sound exposure ranges from subtle responses, which may be difficult to observe and have little implications for the affected animal, to obvious responses, such as avoidance or panic reactions. The context in which the sound is received by an animal affects the nature and extent of responses to a stimulus. The threshold for elicitation of behavioural responses depends on received sound level, as well as multiple contextual factors such as the activity, state of animals exposed to different sounds, the nature and novelty of a sound, spatial relations between a sound source and receiving animals, and the gender, age and reproductive status of the receiving animal.
- physiological impacts – auditory threshold shift (temporary and permanent hearing loss) – marine fauna exposed to intense sound may experience a loss of hearing sensitivity, or even potentially mortal injury. Hearing loss may be in the form of a temporary threshold shift (TTS) from which an animal recovers within minutes or hours, or a permanent threshold shift (PTS) from which the animal does not recover.

Available threshold criteria associated with behavioural and physiological impacts for sensitive receptors have been derived from a number of sources (National Marine Fisheries Service, 2024; Popper et al., 2014; Southall et al., 2019a). These criteria have been compared with measured and predicted sound levels for different sound sources to assess potential impacts.

#### 6.4.2.1 Marine Mammals

Marine mammals, especially cetaceans, rely on sound for individual recognition, socialising, detecting predators and prey, navigation and reproduction (Erbe, 2012; Erbe et al., 2016; Weilgart, 2007). Underwater noise can affect marine mammals in various ways including interfering with communication (masking), behavioural changes, a shift in the hearing threshold (PTS and TTS), physical damage and stress (Erbe, 2012).

Marine mammals that may occur within the vicinity of the OAs include low frequency (such as baleen whales), high frequency (ondocetes such as orca and sperm whale), very high frequency (such as dolphins) cetaceans (3.2.6).

The thresholds that could result in a behavioural response, temporary threshold shift (TTS) and permanent threshold shift (PTS) for cetaceans as a result of continuous (e.g. vessel noise) and impulsive (e.g. VAP) noise sources are presented in Table 6-7 and Table 6-8. These thresholds have been adopted by the United States National Oceanic and Atmospheric Administration (NOAA) (2019a), National Marine Fisheries Service (NMFS) (2024) and Southall et al. (2019b).

**Table 6-7: Thresholds for PTS, TTS and behavioural response onset for cetaceans, sirenians and pinnipeds for continuous noise**

| Hearing Group | Auditory Injury Onset Threshold: $SEL_{24h}$ (dB re 1 $\mu Pa^2.s$) | TTS Onset Threshold: $SEL_{24h}$ (dB re 1 $\mu Pa^2.s$) | Behavioural Response (dB re 1 µPa) |
|---|---|---|---|
| LF cetaceans | 197 | 177 | 160 |
| HF cetaceans | 201 | 181 | 160 |
| VHF cetaceans | 181 | 161 | 160 |
| Sirenians | 200 | 180 | - |
| Otariid pinnipeds | 199 | 179 | 160 |

*Source: NMFS (2024), Southall et al. (2019b), NOAA (2019a)*

**Table 6-8: Thresholds for PTS, TTS and behavioural response onset for cetaceans and sirenians for impulsive noise**

| Hearing Group | NOAA (2019b) | NMFS (2024) | | | |
|---|---|---|---|---|---|
| | Behaviour | Auditory Injury Onset Thresholds (Received Level) | | TTS Onset Thresholds (Received Level) | |
| | SPL ($L_p$; dB re 1 µPa) | Weighted $SEL_{24h}$ ($L_{E,24h}$;dB re 1 $\mu Pa^{2 \cdot s}$) | PK ($L_{Pk}$; dB re 1 µ Pa) | Weighted $SEL_{24h}$ ($L_{E,24h}$; dB re 1 $\mu Pa^{2 \cdot s}$) | PK ($L_{Pk}$; dB re 1 µ Pa) |
| LF cetaceans | 160 | 183 | 222 | 168 | 216 |
| HF cetaceans | 160 | 193 | 230 | 178 | 224 |
| VHF cetaceans | 160 | 159 | 202 | 144 | 196 |
| Sirenians | - | 186 | 225 | 171 | 219 |
| Otariid pinnipeds | 160 | 185 | 230 | 170 | 224 |

*Source: (NMFS, 2024)*

The OAs do not intersect any BIAs for humpback or pygmy blue whales. However, the 20 km noise assessment buffer for the Currie OA overlaps with the pygmy blue whale migration BIA (located 9 km from the Curie OA), while the 20 km noise assessment buffer for the Mestrel/Bancroft OA overlaps with the humpback whale migration BIA (located 13 km from the Mestrel/Bancroft OA) (see Figure 3-10 and Figure 3-11).

Other species of marine mammals may also be exposed to underwater noise from the activities; however, humpback and pygmy blue whales are considered to be the most vulnerable to impacts due to their seasonal presence in the vicinity of the OAs.

The *Conservation Management Plan for the Blue Whale* (Commonwealth of Australia, 2015b), a recovery plan made under the EPBC Act, defines BIAs for pygmy blue whales, with particular emphasis placed on foraging areas and migration corridors. Migrating pygmy blue whales are unlikely to occur in the OAs in high numbers, with observed and modelled distributions of pygmy blue whales occurring further offshore in deeper water (Double et al., 2014; Thums et al., 2022). When considering the *Conservation Management Plan for the Blue Whale* (Commonwealth of Australia, 2015b) and Guidance on key terms within the Plan, underwater noise emissions from the activities are consistent with the requirements of the plans.

Humpback whales are seasonally present in the NWS region during their annual migrations to and from breeding areas in northern Western Australia. Aerial surveys and tagging studies of humpback whales indicate that most migrating humpbacks occur in waters ranging from ~95–125 m, but considerable numbers of humpback whales have been observed in the region in water greater water depths similar to the OAs (Double et al., 2012, 2010; RPS Environment and Planning, 2010; Thums et al., 2018). It is reasonable to conclude that a portion of the humpback whale population may occur in or near the OAs during seasonal migrations and hence be exposed to underwater noise at levels that may cause impacts. Known important areas for humpback whales, such as foraging or cow/calf resting areas do not occur in or near the OAs (see Figure 3-11).

There is no significant habitat or BIAs for sirenians in or near the OAs. Although dugongs have been identified as potentially occur within the OAs based on the PMST results, it is unlikely given the absence of suitable habitat.

**Potential impacts from continuous noise**

Vessels holding station using DP have potential to cause impacts to humpback whales and pygmy blue whales due to their relatively high source level and broadband nature, which includes low frequency components that overlap

their functional hearing range. Other sources of continuous noise are less likely to result in impacts due to their lower source levels (e.g. MODU noise).

Source levels of noise from vessels using DP will not credibly exceed the PTS threshold for low frequency cetaceans. Noise levels would only credibly exceed the TTS threshold in the immediate vicinity of the source (i.e. tens of metres from a thruster) and would require the cetacean to remain in this proximity to the noise source for a sustained period of time. Humpback whales or pygmy blue whales receiving sufficient noise for PTS and TTS is not considered credible from vessel operations.

Noise levels that exceed the behavioural impact threshold may extend from vessels to ~4 km (see Section 6.4.1.2). Migrating humpback whales within this area may experience behavioural disturbances, such as avoidance of the noise source, increased swimming speed and increased diving frequency. These behavioural responses have been observed in response to the presence of vessels in humpback migration areas, although the effect of the vessel (and seismic source) did not stop migration (Dunlop et al., 2015). Consequently, underwater noise emissions to humpback whales may induce short-term behavioural responses in animals close to vessels, but this will affect a small portion of the population and will not impact migration behaviour.

Vessel noise may also mask whale calls, which may interfere with the perception of communication and result in species increasing their call volumes. Masking would only credibly occur when vessels are holding station using DP. Adult male humpback whales call most frequently and loudly during migration, with females and calves vocalising more quietly and far less frequently (Gosby et al., 2022; Salgado-Kent et al., 2012).

Helicopter noise would only credibly impact upon cetaceans during take-off and landing at the MODU or vessels. Cetaceans are unlikely to be close to the MODU during helicopter take-off and landings, as they are likely to be displaced due to the noise generated by the MODU and vessels. Given helicopter noise is largely be reflected by the sea surface and take-off and landing operations are short-term, impacts to cetaceans from helicopter noise are very unlikely to occur.

Where two MODUs and support vessels operate concurrently in separate OAs, there is a potential for the underwater noise fields to overlap, However, the OAs are located in an open ocean and there are no impediments to the migration of humpback whales in proximity to the OAs. Additionally, the OAs are located >11 km from each other and therefore the sound fields that could produce behavioural impacts will not overlap given that the noise levels that exceed the behavioural levels may exceed for up to 4 km for cetaceans. Therefore, the cumulative impacts of the two MODUs and support vessels operating concurrently in separate OAs is expected to be limited to short term behavioural responses within or in close proximity to each OA with no impact on migration behaviour. Cumulative impacts resulting from PTS and TTS are not considered credible.

**Potential impacts from impulsive noise**

Geophysical survey equipment has been modelled at a number of locations, including the coast of Russia, Greenland, California and the Otway Basin (Zykov et al., 2013; Austin et al., 2012; McPherson & Wood, 2017). These studies, along with the example of accumulation provided in McPherson (2020), indicate both peak and frequency-weighted SEL noise emissions from survey equipment, such as MBES operating at 400 kHz, are typically below sound levels that could result in low- and high-frequency marine mammal TTS or PTS from either PK or SEL criteria (Table 6-8) in a horizontal direction. The threshold for behavioural disturbance (Table 6-8) could be exceeded within 120 m (McPherson, 2020). SSS impulses and MBES sound levels are outside the auditory range of LF species and baleen whales (such as humpback and pygmy blue whales), but within the mid-frequency and HF cetacean marine fauna auditory range. However, PTS and TTS thresholds for these species (Table 6-8) are only expected to be exceeded close to the source. Due to the lack of aggregating areas for these species, individuals are expected to be transitory only, displaying behavioural responses, and moving away from the source before TTS and PTS thresholds are exceeded. Noise generated by acoustic emissions from positioning equipment (e.g. USBL and LBL) also operate in frequencies that overlay the functional hearing range of HF cetaceans, however the operate at lower sound levels that the geophysical survey equipment.

Survey equipment could cause masking of vocalisations of cetaceans due to the overlap in frequency range between signals and vocalisations. Masking will primarily apply to HF cetaceans, with all signals above 2 kHz. Higher frequency sounds have limited propagation, and attenuate rapidly, resulting in a relatively small area of influence. Therefore, the range at which masking impacts could occur would be limited to within hundreds of metres from the sound source.

Sound levels from VAP operations are conducted over a period of approximately 12 hours. The *Behavioural Response of Australian Humpback Whales to Seismic Survey's* (BRAHSS) (Cato et al, 2019) found short-term changes in the behaviour of migrating humpback whales that were exposed to seismic air guns. These changes in behaviour included dive behaviour (making less progress southwards) and social behaviour, however the study noted that no 'abnormal' behaviours were noted (e.g. groups turning and migrating in the opposite direction, groups ceasing to migrate or moving at high speed, abnormally high or low rates of surface behaviours, cessation of breeding interactions etc.) (Cato et al, 2019).

VAP operations modelling for the Dorado development (JASCO, 2020) in similar water depth and region to the OAs showed that within 260 m of a VAP source the received level will be below the PTS and TTS onset thresholds.

Marine mammals may show behavioural responses to VAP noise emissions; however, this is expected to be localised (~2.42 km from VAP operations). Given the transient and mobile nature of marine mammals, and the short-term nature of the VAP activities, the impact of noise on marine mammals is expected to be limited.

#### 6.4.2.2 Marine Turtles

There are five species of marine turtle that may occur in the OAs: loggerhead turtle, green turtle, leatherback turtle, hawksbill turtle, and flatback turtle (see Section 3.2.6). The Mestrel/Bancroft OA is directly adjacent to the reproduction (internesting buffer) BIA for flatback turtles (see Figure 3-17).

Recent tagging studies have identified that waters utilised by flatback turtles during post-nesting migration and foraging are typically <50 m deep and <66 km from shore (Whittock et al. 2016; Thums et al. 2018). Thums et al. (2018) specifically studied flatback turtles during their post-nesting migration from the Lacepede Islands and during foraging. The study found that flatback turtles migrated along the coast in water depths of 63 ± 5 m, passing near Adele Island on the way to foraging grounds on the Sahul Shelf in the Timor Sea. Based on this, it is unlikely that significant numbers of internesting flatback turtles would be present within the OAs given the water depths (80–265 m).

*The Recovery Plan for Marine Turtles in Australia 2017–2027 (*Commonwealth of Australia, 2017) identifies noise interference from anthropogenic activities as a threat to marine turtles. The plan refers to vessel noise and the operation of some oil and gas infrastructure as sources of chronic (continuous) noise in the marine environment, exposure to which may lead to avoidance of important turtle habitat. The criteria for continuous and impulsive sound sources applies to marine turtles are shown in Table 6-9 and Table 6-10 respectively.

**Table 6-9: Acoustic effects of continuous noise on marine turtles**

| Potential Marine Fauna Receptor | Popper et al. (2014) | NMFS (2024) dB SPL RMS | Finneran et al (2017) Weighted $SEL_{24h}$ ($LE_{,24h}$; dB re 1 µPa2·s) | |
|---|---|---|---|---|
| | Masking | Behaviour | PTS onset threshold | TTS onset threshold |
| Marine Turtle | (N) High<br>(I) High<br>(F) Moderate | 175 | 220 | 200 |

*Note: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N) – tens of metres, intermediate (I) – hundreds of metres, and far (F) – thousands of metres for Popper et al. (2014)*

**Table 6-10: Acoustic effects of impulsive noise on marine turtles**

| NMFS (2024) | NMFS (2024) Finneran et al (2017) | | | |
|---|---|---|---|---|
| Behaviour | PTS onset threshold | | TTS onset threshold | |
| dB SPL RMS | Weighted $SEL_{24h}$ ($LE_{,24h}$; dB re 1 $\mu Pa^2$ - s) | PK (Lpk; dB re 1 µPa) | Weighted $SEL_{24h}$ ($LE_{,24h}$; dB re 1 $\mu Pa^2$ ·-s) | PK ($L_{pk}$; dB re 1 µPa) |
| 175 | 204 | 232 | 189 | 226 |

There is a paucity of data regarding responses of turtles to acoustic exposure, and no studies of hearing loss due to exposure to loud sounds. Popper et al. (2014) suggested thresholds for onset of mortal injury (including PTS) and mortality for sea turtles and, in absence of taxon-specific information, adopted the levels for fish that do not hear well (suggesting that this likely would be conservative for sea turtles).

Finneran et al (2017) proposed revised thresholds for marine turtle injury and hearing impairment (TTS and PTS). Their rationale is that marine turtles have best sensitivity at low frequencies and are known to have poor auditory sensitivity (Ketten and Barol, 2006). Accordingly, TTS and PTS thresholds for turtles are likely more similar to those of fishes than to marine mammals (Popper et al., 2014).

Studies show that behavioural responses such as an increase in swimming activity occurred with received sound levels of ~166 dB re 1 µPa and an avoidance response and behaving erratically occurred at around 175 dB re 1 µPa (McCauley et al., 2000, NMFS, 2024). Source levels from vessels using DP may exceed these levels and hence may result in behavioural responses in marine turtles.

Based on the criteria detailed within Table 6-9 and if vessels operating on DP emit ~182 dB re 1 µPa at 1 m (RMS SPL) (McCauley 1998), PTS and TTS will not credibly occur. Behavioural changes, for example, avoidance and diving, are only predicted for individuals in close proximity to noise sources, particularly vessels holding station using DP. These are expected to occur in within hundreds of metres of the noise source and hence may result in a short-term displacement of marine turtles around vessels. Turtles have not been shown to have a reliance on sound for finding food or avoiding predators, hence masking is unlikely to occur.

Although VAP operations conducted over a period approximately 12 hours will result in the thresholds for PTS, TTS and behavioural impacts being exceeded if they are exposed near the source, individuals are expected to display behavioural response to the source, moving away and outside the range at which TTS could occur. Based on modelling of a VSP for the Santos Dorado development (JASCO, 2020) the maximum distance to the NMFS 2024 criterion for behavioural effects in sea turtles of 175 dB re 1 µPa (SPL) is 0.38 km. Given the transient and mobile nature of marine turtles, effects of noise are expected to be limited to behavioural impacts during VAP activities. No impacts at a population level are anticipated.

Where two MODUs and support vessels operate concurrently in separate OAs, there is potential for the underwater noise fields to overlap, noting that vessels using DP may exceed levels that could result in behavioural responses in turtles within hundreds of metres of the source and therefore, the areas in which behavioural impacts may occur remain highly localised to the source location given the distance between OAs (>11 km). The OAs are located in deep offshore waters (80–265 m) that are not typical internesting or foraging depths for flatback turtles and other species known to occur regionally. Additionally, turtles have poor auditory sensitivity and do not rely heavily on sound for foraging or predator avoidance, further reducing the likelihood of significant effects. Therefore, the cumulative impacts of two MODUs and support vessels operating concurrently in separate OAs are expected to be limited to short-term behavioural responses in individual turtles in proximity to vessels and MODUs, with no impact on critical habitat use or population-level effects.

#### 6.4.2.3 Sharks, Rays and Fish

All fish species can detect noise sources, although hearing ranges and sensitivities vary substantially between species (Dale et al., 2015). Sensitivity to sound pressure seems to be functionally correlated in fishes to the presence and absence of gas-filled chambers in the sound transduction system. These enable fishes to detect sound pressure and extend their hearing abilities to lower sound levels and higher frequencies (Ladich and Popper, 2004). Based on their morphology, Popper et al. (2014) classified fishes into three animal groups comprising:

- fishes with swim bladders whose hearing does not involve the swim bladder or other gas volumes;
- fishes whose hearing does involve a swim bladder or other gas volume; and
- fishes without a swim bladder that can sink and settle on the substrate when inactive.

Underwater noise impact thresholds for continuous and impulsive noise for the fish categories listed above are provided in Table 6-11 and Table 6-12 for continuous and impulsive noise respectively. Given there is no exposure criteria for sharks and rays, the same criteria are adopted, though typically sharks and rays do not possess a swim bladder.

**Table 6-11: Continuous noise: Criteria for noise exposure for fish, adapted from Popper et al. (2014)**

| Potential Marine Fauna Receptor | Mortality and Potential mortal injury | Impairment | | | Behaviour |
|---|---|---|---|---|---|
| | | Recoverable injury | TSS | Masking | |
| Fish: No swim bladder (particle motion detection) | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) Moderate<br>(I) Low<br>(F) Low | (N) High<br>(I) High<br>(F) Moderate | (N) Moderate<br>(I) Moderate<br>(F) Low |
| Fish: Swim bladder not involved in hearing (particle motion detection) | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) Moderate<br>(I) Low<br>(F) Low | (N) High<br>(I) High<br>(F) Moderate | (N) Moderate<br>(I) Moderate<br>(F) Low |
| Fish: Swim bladder involved in hearing (primarily pressure detection) | (N) Low<br>(I) Low<br>(F) Low | 170 dB SPL for 48 h | 158 dB SPL for 12 h | (N) High<br>(I) High<br>(F) High | (N) High<br>(I) Moderate<br>(F) Low |
| Fish eggs and fish larvae | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) Low<br>(I) Low<br>(F) Low | (N) High<br>(I) Moderate<br>(F) Low | (N) Moderate<br>(I) Moderate<br>(F) Low |

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

**Table 6-12: Impulsive noise: Criteria for noise exposure for fish, adapted from Popper et al. (2014)**

| Potential Marine Fauna Receptor | Mortality and Potential mortal injury | Impairment | | | Behaviour |
|---|---|---|---|---|---|
| | | Recoverable injury | TSS | Masking | |
| Fish: No swim bladder (particle motion detection) | >219 dB $SEL_{24h}$ or >213 dB PK | >216 dB $SEL_{24h}$ or >213 dB PK | >186 dB $SEL_{24h}$ | N) Low<br>(I) Low<br>(F) Low | (N) High<br>(I) Moderate<br>(F) Low |
| Fish: Swim bladder not involved in hearing (particle motion detection) | 210 dB $SEL_{24h}$ or >207 dB PK | 203 dB $SEL_{24h}$ or >207 dB PK | >186 dB $SEL_{24h}$ | N) Low<br>(I) Low<br>(F) Low | (N) High<br>(I) Moderate<br>(F) Low |
| Fish: Swim bladder involved in hearing (primarily pressure detection) | 207 dB $SEL_{24h}$ or >207 dB PK | 203 dB $SEL_{24h}$ or >207 dB PK | 186 dB $SEL_{24h}$ | (N) Low<br>(I) Low<br>(F) Moderate | (N) High<br>(I) High<br>(F) Moderate |
| Fish eggs and fish larvae | >210 dB $SEL_{24h}$ or >207 dB PK | (N) Moderate<br>(I) Low<br>(F) Low | (N) Moderate<br>(I) Low<br>(F) Low | N) Low<br>(I) Low<br>(F) Low | (N) Moderate<br>(I) Low<br>(F) Low |

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

Noise effects on fish may result in indirect impacts to fisheries through changes in fish behaviour. Individual demersal fish may be impacted in the vicinity of the activity other mobile pelagic species may transverse the OAs. The OAs are not known to be an important spawning or aggregation habitat for commercially caught targeted species. Therefore, no impacts to fish stocks are expected.

Whale sharks could potentially be impacted from operational noise if in the area. Although the OAs do not overlap the foraging high density prey BIA, they do overlap the foraging BIA (Figure 3-9). Whale sharks would be expected to show avoidance to vessel noise, although they are likely to tolerate low level noise, as they have been observed swimming close to oil and gas platforms on the NWS, as well as charter vessels for tourism purposes during the aggregations at Ningaloo Coast.

Based on criteria developed by Popper et al. (2014) for continuous and impulsive noise impacts on fish, noise from the activities has a low risk of resulting in mortality and TTS impacts and would only occur if fish remain in very close proximity to the noise sources. The most likely impacts to fish from noise will be behavioural responses. Popper et al. (2014) identified a moderate risk of behavioural impacts to fish in near (tens of metres) and intermediate distances (hundreds of metres) from the noise sources (including airgun). Given the thresholds outlined in Table 6-11 and Table 6-12, it is reasonable to expect that fish, sharks and rays may demonstrate avoidance or attraction behaviour to the noise generated by the activities. Where two MODUs and support vessels operate concurrently in separate OAs, there is potential for the underwater noise fields to overlap. Fish species can detect underwater noise and may exhibit short-term behavioural responses such as avoidance or attraction within tens to hundreds of metres of the noise source (i.e. restricted to close proximity of the noise source location within each OA). Sharks and rays, which typically do not possess a swim bladder, are expected to respond in a similar way. Given the open ocean setting and the mobility of fish, sharks and rays, any cumulative impacts from two MODUs and support vessels operating concurrently in separate OAs are expected to be limited to temporary and localised behavioural responses close to the source, with no impacts at the population level.

#### 6.4.2.4 Invertebrates

Benthic invertebrates are unlikely to be negatively impacted from noise generated by the activities. There is no convincing evidence of continuous noise consistent with that generated by the activities resulting in harmful effects to benthic invertebrates.

For impulsive noise, the source is an important consideration in the assessment. Research to date has focussed on the effects of noise from seismic surveys, which is substantially higher source levels and lower frequency than the noise sources that will credibly be generated during the VAP or survey activities. Sound energy levels (SEL), 24-hr cumulative SEL and peak-to-peak SEL (PK-PK) for invertebrates from Day et al. (2016) and Payne et al. (2008) derived from seismic noise exposure are provided in Table 6-13. These thresholds were shown to result in sub-lethal effects (e.g. delayed righting reflex in lobsters). Only very high intensity acoustic emissions from would credibly exceed these thresholds and the short duration VAP activities and survey activities are not anticipated to result in any impacts, particularly given the lack of commercially exploited invertebrate stocks (e.g. pearl oysters, rock lobsters) in the OAs.

**Table 6-13: Impulsive noise: Sound levels relevant to invertebrates**

| Receptor | Sound Levels |
|---|---|
| Invertebrates: effect at the seafloor (Day et al., 2016) | 186–190 dB SEL<br>192–199 dB $SEL_{24h}$<br>209–212 dB PK-PK |
| Invertebrates: no effect at the seafloor (Payne et al., 2008) | 202 dB PK-PK |

#### 6.4.2.5 Seabirds

The OAs overlap a number of seabird breeding BIAs (see Table 3-10). Seabirds and migratory shorebirds within the OAs are unlikely to be directly affected by underwater noise generated during the activities. However, they may avoid helicopters and flaring from the MODU. Given the relative infrequency of helicopter flights and flaring, and lack of lasting effect of potential behavioural responses to helicopter and flaring noise, impacts are expected to be negligible.

#### 6.4.2.6 Cultural Receptors

Totemic species of cultural value may pass through the OAs; however, during consultation, Santos has not been made aware of any other cultural receptors within the OAs. Noise impacts to marine species and seabirds have been assessed above.

#### 6.4.2.7 Cumulative Impacts

Where two MODUs and support vessels operate concurrently in separate OAs, underwater noise fields that may produce behavioural responses in marine fauna are not expected to overlap given the spatial separation between OAs (>11 km). For marine mammals, noise levels that could cause behavioural responses may extend up to 4 km from the source, while fish, sharks, rays and marine turtles are expected to show short-term behavioural responses within tens to hundreds of metres from noise sources. The OAs are located in open ocean waters and there are no impediments to movement, allowing fauna to avoid areas of elevated noise. The duration of exposure will be limited to the relatively short period of drilling and associated activities. Given this natural avoidance behaviour, the absence of sensitive feeding or aggregation areas in the OAs, and the short duration of drilling and support activities, any potential cumulative underwater noise impacts are expected to be localised, minor and have no lasting impact.

### 6.4.3 Environmental Performance Outcomes and Control Measures

The EPO relating to this event is:

- No injury or mortality to EPBC Act and BC Act listed marine fauna during activities [BB-EPO-05]

The control measures considered for this event are outlined in Table 6-14 and the EPS and measurement criteria for the EPOs are described in Table 8-2.

**Table 6-14: Control measures evaluation for noise emissions**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measure** | | | | | |
| BB-CM-23 | Santos procedure for interacting with marine fauna. | Administrative | Reduces risk of physical and behavioural impacts to marine fauna from vessels and helicopters. If marine fauna are sighted, then vessels can slow down or move away, and helicopters can increase distances from sighted fauna if required. | Operational costs to adhere to marine fauna interaction restrictions, such as vessel and helicopter speed and direction, are based on legislated requirements and must be accepted. | **Adopted**<br>Benefits in reducing impacts to marine fauna outweigh the costs incurred by Santos.<br>Control measure ensures compliance with Part 8 of the EPBC Regulations. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| BB-CM-24 | MODU planned maintenance system (PMS) | Administrative | Reduces emissions by ensuring contracted MODU is operated, maintained and manned in accordance with industry standards and regulatory requirements. | Cost associated with implementing systems. | **Adopted**<br>Benefits of ensuring vessels are maintained outweigh the costs. |
| BB-CM-25 | Vessel PMS to maintain vessel DP, engines and machinery. | Administrative | Reduces emissions by ensuring contracted vessels are operated, maintained, and manned in accordance with industry standards and regulatory requirements. | Cost associated with implementing systems. | **Adopted**<br>Benefits of ensuring vessels are maintained outweigh the costs. |
| BB-CM-26 | Vessel bridge crew receive induction in marine fauna observations and marine fauna interaction requirements | Administrative | Reduces risk of physical and behavioural impacts to marine fauna from vessel, because if they are sighted, then the vessel can slow down or move away. | Minor additional costs associated with induction/training material and time. | **Adopted**<br>Benefits in reducing noise impacts. |
| BB-CM-27 | VAP procedures (including marine fauna observation) | Administrative | Reduces the likelihood of significant noise exposure to marine fauna (cetaceans, whale sharks and turtles) | May result in short delays to VAP operations if marine fauna are detected within the defined exclusion zone. Additional resources required for trained observers and soft start procedures. | **Adopted**<br>Benefits outweigh costs. |
| **Additional Control Measures** | | | | | |
| N/A | Dedicated Marine Mammal Observer (MMO) (as per EPBC Policy Statement 2.1 – Part B.1) | Administrative | Improved ability to spot and identify marine fauna at risk of impact from VAP noise. | Additional cost of contracting several specialist observers while the risk to all listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable presence of some species. | **Not adopted**<br>Cost disproportionate to increase in environmental benefit and given that crew member will be observing for marine fauna during MODU VAP activities.<br>EPBC Act Policy Statement 2.1 is intended to apply to seismic surveys, which produce substantially |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | | higher source level noise concentrated in the functional hearing range of low-frequency cetaceans and over a longer period. The nature and scale of VAP noise from the activities poses substantially less risk to cetaceans than a typical seismic survey.<br>An MFO has been adopted in control measure BB-CM-27 |
| N/A | Undertake site specific acoustic modelling as per approved conservation advice for marine fauna | Administrative | The distance at which marine fauna could experience behavioural impacts can be predicted and compared to literary publications.<br>Additional management controls can then be included if required to support an ALARP justification and reduce potential impacts to marine fauna. | Additional cost to contract consultant to develop a model and produce predicted noise outputs. | **Not adopted**<br>The cost associated with site specific modelling, outweighs any environmental benefit, and no further controls can be implemented to reduce vessel noise or VAP other than not undertaking the activity.<br>The OAs do not overlap with the humpback and pygmy blue whale migration BIAs, with the closest OAs being Curie OA (~9 km away from the pygmy blue whale migration BIA) and Mestrel/Bancroft (~13 km away from the humpback whale migration BIA) (Figure 3-9). PTS and TTS to low-frequency whales (such as humpback and pygmy blue whales) could occur near a vessel, but this scenario is unlikely as animals will move away from harmful levels of continuous noise. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | | Behavioural impacts may occur at up to 4 km from a vessel using DP and 2.4 km from the VAP source. As whales are always moving and transiting through the area, they are expected to actively avoid the noise source while transiting. Impacts are predicted to be temporary. |
| N/A | Develop a noise management plan as per approved conservation advice for marine fauna | Administrative | Potential reduction in impacts to marine fauna. | No additional cost other than negligible personnel costs of preparing and reviewing the management plan. | **Not adopted**<br>The activity does not occur in any resting, feeding, calving or confined migratory pathway for protected cetacean species, therefore the cost associated with the development of a management plan outweighs the little or no benefit for a short duration activity which has a minor impact (e.g. potential temporary and minor behavioural changes). This EP, including control measures constitutes a management plan, no additional benefits identified. |
| N/A | Use of passive acoustic monitoring (PAM) | Engineering | Improve detection of some sensitive receptors. | Costs of PAM operators.<br>Operational costs of shut-downs potentially prolonging the activities. | **Not adopted**<br>Cost is disproportionate to increase in environmental benefit given the minor behavioural response expected.<br>Limited ability of PAM to detect cetaceans (i.e. sensitive receptors including baleen whales) would provide little benefit to the species expected to be present. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| N/A | Verification of noise levels | Administrative | Allow implementation of adaptive management controls should impact be greater than expected. | Costs of deploying noise monitoring equipment and processing of data. | **Not adopted** Cost is disproportionate to increase in environmental benefit given the rapid reduction in noise levels from vessels and VAP and the low level behavioural response expected. |
| N/A | Schedule activities to avoid coinciding with sensitive periods such as the humpback whale migration period (June to November) | Eliminate | Reduce risk of impacts from noise emissions during environmentally sensitive periods for listed marine fauna | High cost in moving or delaying activity schedule. The risk to all listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods | **Not adopted** The timing of the drilling activities will be subject to vessel and MODU availability and weather conditions. Given the low risk to marine fauna restricting the activity timing will not result in significant environmental benefit. |

### 6.4.4 Environmental Impact Assessment

| Receptor | Consequence Level |
|---|---|
| **Noise Emissions** | |
| Threatened, migratory or local fauna | While the level of noise expected from short-term and intermittent activities has the potential to cause TTS to marine fauna, most species and individuals that may transit through the area are expected to demonstrate avoidance behaviour if noise levels approach those that could cause harmful effects. Avoidance behaviour is likely to be localised within the area of the activity (due to small spatial extent of elevated noise) and temporary; i.e. for the duration of the noise emissions only.<br>Whilst the OAs do not overlap with the humpback and pygmy blue whale migration BIAs, a pygmy blue whale migration BIA lies ~9 km from the Currie OA and a humpback whale migration BIA is located ~13 km from the Mestrel/Bancroft OA. PTS and TTS to low-frequency whales (such as humpback and pygmy blue whales) could occur near a vessel, but this scenario is unlikely as animals will move away from harmful levels of continuous noise. Behavioural impacts may occur at up to 4 km from a vessel using DP and 2.4 km from the VAP source. As whales are always moving and transiting through the area, they are expected to actively avoid the noise source while transiting. Impacts are predicted to be temporary.<br>The *Blue Whale Conservation Management Plan* (DoE, 2015b) recognises that aircraft noise and industrial noise (including drilling) can result in minor impact to blue whales, though also recognises that avoidance of these activities is typically shown.<br>The application of the VAP survey procedures limit any effects to sensitive species to behavioural impacts rather than physiological effects, such as avoidance and course change during movement, which will be restricted to an ~12–18-hour window per well. Any impacts to behaviour will be limited to transient individuals in the vicinity of the MODU to a maximum distance of 2.4 km. The OAs are not within or near any significant feeding, resting or calving areas for cetacean species.<br>The *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017) specifies the following priority actions for all stocks of marine turtles:<br>• manage anthropogenic activities to ensure marine turtles are not displaced from identified habitat critical to the survival<br>• manage anthropogenic activities in BIAs to ensure that biologically important behaviours (BIBs) can continue. |

| Receptor | Consequence Level |
|---|---|
| | The Mestrel/Bancroft OA is directly adjacent to the reproduction (internesting buffer) BIA for flatback turtles (see Figure 3-17). Individual turtles may be encountered within the OAs but are unlikely to be internesting females due to the distance from the closest known nesting beaches located on Bedout Island (~65 km from Mestrel/Bancroft OA) and water depths in the OAs (80–265 m) (see Section 6.4.2.2).<br>It is possible that whale sharks could pass through the OAs, as the whale shark foraging BIA overlaps all OAs, particularly before and after their annual aggregation off Ningaloo Reef. However, less numbers are expected than within the foraging (high-density prey) BIA, which does not overlap the OAs. Any impacts to whale sharks will be limited to potential short-term behavioural impacts given the sensitivity of this species and the nature and scale of the noise emissions from the activities. Impacts to other fish species will be similar and limited to short-term behavioural impacts.<br>Seabirds are also unlikely to be directly affected by noise generated during the activity. Although the OAs overlap a number of seabird BIAs (see Table 3-10) the potential for airborne noise from the activity to cause disturbance to seabirds not credible.<br>Given the nature and scale of noise emissions from the MODU, vessels, helicopters, VAP and associated activities, and the relatively short duration of noise emissions (particularly VAP), as well as the controls to manage interaction with marine fauna, cumulative impacts to marine fauna from noise emissions associated with concurrent project activities are not expected.<br>Where two MODUs and support vessels operate concurrently in separate OAs, underwater noise fields that may produce behavioural responses in marine fauna are not expected to overlap given the spatial separation between OAs (>11 km). For marine mammals, noise levels that could cause behavioural responses may extend up to 4 km from the source, while fish, sharks, rays and marine turtles are expected to show short-term behavioural responses within tens to hundreds of metres from noise sources. The OAs are located in open ocean waters and there are no impediments to movement, allowing fauna to avoid areas of elevated noise. The duration of exposure will be limited to the relatively short period of drilling and associated activities. Given this natural avoidance behaviour, the absence of sensitive feeding or aggregation areas in the OAs, and the short duration of drilling and support activities, any potential cumulative underwater noise impacts are expected to be localised, minor and have no lasting impact.<br>Noise impacts will be of relatively short duration and with the implementation of the management controls, impacts to local populations for threatened or migratory species are likely to be minor. The consequence level is assessed as II – Minor. |
| Physical environment or habitat | Not applicable – noise will not impact the physical environment itself, only the species mentioned above utilising it. |
| Threatened ecological communities | Not applicable – No threatened ecological communities identified in the area over which noise emissions are expected. |
| Protected areas | Not applicable – No protected areas within immediate vicinity of the operational area. |
| Socio-economic receptors | Noise levels are not expected to impact on socio-economic receptors due to their low activity level within the vicinity of the operational area. Impacts to fish may result in-indirect impacts to commercial fisheries in the area given the potential for temporary avoidance behaviour. However, given the short duration of the activity, limited impacts from the noise levels emitted from the activity, impacts to fisheries are considered negligible. There are no recreation zones within the area expected to be impacted by noise.<br>Impacts to totemic species have been addressed under local fauna. The consequence level is assessed as I – Negligible. |
| Overall worst-case consequence | II – Minor |

### 6.4.5 Demonstration of as Low as Reasonably Practicable

The use of the MODU and support vessels is essential for the activity to proceed on a 24-hour basis. Standard control measures have been adopted (Table 6-14) to manage noise emissions and reduce impacts to marine fauna. The procedure for interacting with marine fauna will be implemented, requiring vessels and helicopters to maintain minimum separation distances from cetaceans, whale sharks and other sensitive species. This control reduces the risk of physical and behavioural impacts to marine fauna and ensures compliance with Part 8 of the EPBC Regulations. A PMS will be maintained for both the MODU and the support vessels, ensuring engines, dynamic positioning systems and other machinery are operated and maintained in accordance with industry and regulatory standards. Regular maintenance will help to minimise noise emissions by keeping vessel noise levels within normal operational limits. Vessel bridge crew will receive an induction on marine fauna observations and marine fauna interaction requirements. VAP procedures will be implemented including trained crew observations, soft-start procedures, continuous monitoring for marine fauna during soft start, and shut-down if fauna are detected

within the exclusion zone. These controls ensure noise levels remain within normal operating limits, reducing risks to marine fauna, and are considered proportionate given the operational and compliance benefits achieved. Vessels and helicopters will emit sufficient noise to allow sensitive species to detect and avoid the activity, and all crews will be inducted in relevant environmental requirements.

- Santos has adopted a control measure to use a marine fauna observer as part of VAP activities (BB-CM-27). Prior to conducting VAP, a fauna observation period will be undertaken by a crew member on the MODU who has received training in sighting and reporting of marine fauna. Fauna observers are typically stationed on the heli-deck to take advantage of clearer views and greater height for better ability to observe any nearby fauna.
- This will be performed for a minimum of 30 minutes within 3 hours of the (VAP) commencing. If fauna are detected within the exclusion zone, the activity will be shut down until they move on.
- Any nearby support vessels will also be asked to report any marine fauna sightings at this time.

Additional controls were considered (Table 6-14) but not adopted. The use of a dedicated Marine Mammal Observer (MMO) during VAP activities was considered but not adopted. While MMOs may improve the detection of protected species, the relatively low-level noise emissions from VAP activities compared to full-scale seismic surveys, combined with the short duration of VAP (~12 hours), means that the risk to marine fauna is already low. It is further expected that the vessels will typically emit sufficient noise for sensitive marine fauna to exhibit avoidance behaviour and move away from the activity to avoid physical impact zones.

Site-specific acoustic modelling was not adopted, as the minor, temporary nature of impacts does not warrant the associated cost, and no further controls would be feasible. Similarly, the development of a separate noise management plan was not adopted. As the activity does not occur within any critical habitat such as resting, feeding, calving or confined migratory pathways, the benefit of preparing a dedicated plan would be negligible. The use of PAM was also considered but not adopted due to negligible additional benefits and disproportionate costs. Similarly, verifying noise levels through active monitoring was considered unnecessary given the low expected behavioural impacts. Adjusting the schedule to avoid the humpback whale migration period was also not adopted, as the OAs do not overlap critical habitats, and timing constraints would impose significant operational costs without material environmental benefit.

All practical control measures have been reviewed (Section 6.4.3), and those adopted, as detailed in Table 6-14, are considered appropriate to manage the impacts such that the residual consequence is assessed to be II – Minor and cannot be reduced further. The proposed management controls for noise emissions are in accordance with the Santos' risk management criteria and are considered appropriate to manage the risk to ALARP.

### 6.4.6 Acceptability Evaluation

| | |
|---|---|
| **Is the consequence ranked as I (Negligible) or II (Minor)?** | Yes – maximum consequence from noise emissions is II – Minor. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are the risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure which considers principles of ecologically sustainable development. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?** | Yes –Management consistent with EPBC Regulations Part 8 (vessels and aircraft) and Part A of EPBC Act Policy Statement 2.1 (VAP). Controls implemented will minimise the potential impacts from the activity to species identified in recovery plans and conservation advice as having the potential to be impacted by noise emissions. Relevant species recovery plans, conservation management plans and management actions, including but not limited to the:<br>• *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017)<br>• *Approved Conservation Advice for Balaenoptera borealis* (sei whale) (TSSC, 2015d)<br>• *Approved Conservation Advice for Balaenoptera physalus* (fin whale) (TSSC, 2015c)<br>• *Approved Conservation Advice for Rhincodon typus* (whale shark) (TSSC, 2015e)<br>• *North-west Commonwealth Marine Reserves Network Management Plan 2014-24 (*Director of National Parks, 2018)<br>• *Conservation Management Plan for the Blue Whale: A Recovery Plan under the Environment Protection and Biodiversity* |

| | |
|---|---|
| | *Conservation Act 1999 2015-2025* (Commonwealth of Australia, 2015)<br>• *Conservation Management Plan for the Southern Right Whale: A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999 2011-2021 (Commonwealth of Australia, 2012).* |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | There were no concerns raised during consultation on the EP<br>During the public comment period, comments were raised regarding the use of a marine fauna observer during survey activities. Santos has updated control measure BB-CM-27 to include the use of a MFO during VAP activities, to ensure risks and impacts are consistent with stakeholder expectations.<br>During the public comment period, comments were raised regarding seismic activities. Conventional seismic activities are not proposed under this EP, and the terminology to describe the acquisition of acoustic data for depth verification has been amended. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

The activities will be conducted over ~40–110 days per well, with 7 days site survey prior to drilling (Section 2.1.3). The activities that will generate noise are standard offshore industry practice and the potential impacts well documented.

The controls proposed are consistent with relevant standards, including Part A of EPBC Act Policy Statement 2.1, EPBC Regulations Part 8 (vessels and aircraft), and aligned with the applicable management actions outlined in relevant recovery plans, conservation management plans and approved conservation advice. No concerns from stakeholders (including fisheries) have been raised regarding noise emissions during the activity.

Santos has successfully managed VAP operations over many years without incident. As described above, Part A of Policy Statement 2.1 will be implemented during the VAP operation. As a demonstration of its commitment to ensuring environmental risks are ALARP, Santos' controls extend to all cetaceans, whale sharks and marine turtles, whereas the policy statement is restricted to whales.

Given the short duration of the activity and the proposed management measures, it is reasonable to conclude that noise emissions will not displace turtles from habitat critical to their survival, affect the conservation status of marine turtles or compromise the objectives of the *Recovery Plan for Marine Turtles in Australia 2017- 2027* (Commonwealth of Australia, 2017) and therefore impacts are acceptable.

**Management plans and conservation advice for cetaceans**

The OAs do not intersect any BIAs for humpback or pygmy blue whales. However, the 20 km noise assessment buffer for the Currie OA overlaps with the pygmy blue whale migration BIA (located ~9 km from the Curie OA), while the 20 km noise assessment buffer for the Mestrel/Bancroft OA overlaps with the humpback whale migration BIA (located ~13 km from the Mestrel/Bancroft OA).

The *Conservation Management Plan for the Blue Whale* (Commonwealth of Australia, 2015b) outlines relevant information and requirements related to these considerations:

- interim Objective No. 4: 'Anthropogenic threats are demonstrably minimised.'
- section 5C: discusses threats from noise interference including seismic surveys, acute and chronic industrial noise, masking from anthropogenic noise, shipping noise and aircraft noise.
- action A.2.3 under Anthropogenic threats are demonstrably minimised states that 'Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury and is not displaced from a foraging area'. The *Guidance on Key Terms within in the Blue Whale Conservation Management Plan* (CMP) (DAWE, 2021) provides guidance on what constitutes a foraging area, including opportunistic foraging areas outside of known foraging BIAs.

Activities are considered consistent with the objectives of the conservation management plan and the impacts acceptable for the following reasons:

- a review of noise monitoring data from sources associated with the activity, including the vessels, MODU, internal VAP, ROV operation, side scan sonar (SSS) or echosounders and positioning equipment, determined that the highest noise emitting activity is associated with support vessels using their thrusters to maintain position. The sound pressure level for continuous noise, such as thrusters, above which behavioural impacts are expected for low- frequency cetaceans including the pygmy blue whale, is 160 dB re 1 µPa. Thruster noise

from support vessels has been measured below 120 dB re 1 µPa within 5 km from the noise source (McCauley, 1998; Koessler and McPherson, 2020). Noise from other continuous noise sources is expected to attenuate to below the behavioural impact threshold of 120 dB re 1 µPa within 1 km (Austin et al., 2018).

- given the nearest OA (Curie) is ~9 km from the pygmy blue whale migration BIA and exceeds the noise threshold distance, no significant behavioural impacts to migration activities are expected. No injury to pygmy blue whales that may be encountered during the activity due to noise emissions is also expected as any individuals would be expected to exhibit avoidance behaviours before being exposed to noise levels that may cause injury. Acoustic masking and avoidance behaviour may be expected if pygmy blue whales come within 5 km from the noise source, however no significant impacts to foraging or migration BIAs are expected.
- the nearest pygmy blue whale foraging BIA is >40 km away from the OA and is not expected to be exposed to elevated underwater noise levels. Therefore, pygmy blue whales will not be displaced from a foraging BIA as a result of the activity.
- the controls to manage anthropogenic noise include MODU planned maintenance system, vessel PMS to maintain vessel DP, engines and machinery and procedures for interacting with marine fauna. Santos' procedures for interacting with marine fauna drives activity compliance with EPBC Regulations (Part 8) for managing the risks of noise to cetaceans. Additionally, the activities will not displace an individual or individuals from foraging areas (located distant from the OA) or from potential opportunistic foraging.
- additional controls were considered, such as dedicated marine mammal observers, scheduling operational activities outside of sensitive periods, site specific acoustic modelling and noise management plans etc, however they were assessed and not adopted because the risk of impact from noise on the BIAs is considered minor and therefore the cost is disproportionate to the increase in environmental benefit.

**Recovery plan for marine turtles**

The *Recovery Plan for Marine Turtles in Australia 2017–2027* (Commonwealth of Australia, 2017) highlights noise interference from anthropogenic activities as a threat to marine turtles. The plan refers to vessel noise and the operation of some oil and gas equipment as sources of chronic (continuous) noise in the marine environment, exposure of which may lead to avoidance of important turtle habitat.

It specifies the following priority action related to noise, for all marine turtle stock:

- *manage anthropogenic activities to ensure marine turtles are not displaced from identified habitat critical to the survival.*

The Mestrel/Bancroft OA overlaps with the internesting buffer BIA for flatback turtles. However, given the water depths of the OAs (80–265 m), critical internesting activities are not expected to occur. Whilst transiting individuals may occur in the operational area, given the relatively short duration of the activity and the proposed management measures, it is reasonable to conclude noise emissions will not affect the conservation status of marine turtles or compromise the objectives of the marine turtle recovery plan. Therefore, potential impacts are considered acceptable.

**Summary**

With the controls proposed and considering the relatively short duration and characteristics of noise types planned, the potential consequences of impacts to noise sensitive receptors in the area are assessed to be II – Minor and ALARP.

# 6.5 Atmospheric Emissions

## 6.5.1 Description of Event

| | |
|---|---|
| **Event** | Potential impacts from atmospheric emissions may occur in the OAs from the following sources:<br>• combustion through flaring during well testing (oil and gas). Other gasses ($CO_2$ and $H_2S$) may be produced from the reservoir<br>• hydrocarbon combustion to operate the MODU, vessels and helicopters<br>• operation of incinerators on MODU and the vessels<br>• when transferring dry bulk products used for drilling (e.g. barite, bentonite, cement), tank venting is necessary to prevent tank overpressure. The vent air will contain negligible quantities of product particles, which will suspend in the air or settle on the sea surface.<br>Although the MODU and vessels may use ozone-depleting substances (ODS), this will be in a closed rechargeable refrigeration system and there is no plan to release ODS to the atmosphere. |
| **Extent** | Localised: The quantities of gaseous and solid (powder) emissions are relatively small and will, under normal circumstances, quickly dissipate into the surrounding atmosphere. |
| **Duration** | For the activity duration, with intermittent emissions associated with discrete activities, e.g. flaring |

## 6.5.2 Nature and Scale of Environmental Impacts

**Potential receptors**: physical environment (air quality).

Hydrocarbon combustion during the activity may result in a temporary and localised reduction of air quality in the environment immediately surrounding the discharge point during the activity. Non-greenhouse gas emissions, such as NOX and SOX, can contribute to a reduction in local air quality. Tank venting during bulk transfers is a necessary safety control, and any dust emissions will be negligible and limited to the immediate vicinity of the MODU and support vessels. Air emissions will be similar to other vessels operating in the region for both petroleum and non-petroleum activities. All vessels are required to comply with MARPOL air emissions regulations, by using low sulphur fuel (3.5% reducing to 0.5% in 2020) and NOX emissions controls as applicable to engine age and type. The quantities of gaseous emissions are relatively small and will quickly dissipate into the surrounding offshore atmosphere. Due to the volumes and highly dispersive nature of the emissions no adverse impacts to seabirds or humans are expected.

As the activity will occur in open-ocean offshore waters, the combustion of fuels in such remote locations will not impact on air quality in coastal towns, the nearest being Port Hedland (~123 km from Mestrel/Bancroft OA). The quantities of gaseous emissions are relatively small and will quickly dissipate into the surrounding atmosphere

GHG emissions of an activity are also recognised as contributing to global GHG emissions loading. GHG emissions refer to gases that trap heat within the atmosphere through the absorption of longwave radiation reflected from the Earth's surface. The emissions of carbon dioxide (CO2), nitrous oxide (N2O) and methane (CH4), as relevant to the activity, are recognised as GHG emissions. GHG emissions are linked to global warming and climate change.

The IPCC (2021) have reaffirmed the near-linear relationship between cumulative anthropogenic CO2 emissions and global warming, highlighting the basis for setting net-zero emissions targets. It is known that the physical impacts of climate change on environmental receptors are the result of global GHG emissions from a multitude of sources (minus the GHG sinks) that have accumulated in the atmosphere (IPCC, 2018).

The impacts on the climate cannot be attributed to one specific sector or activity. In the context of evaluating potential impacts and risks that may be associated with GHG emissions from all sources globally, including from this Activity, this EP has considered broader climate change issues. Consideration for the purpose of this EP is framed by the contribution that the activity will make to national and global atmospheric emissions of GHG. This contribution is small, being less than 0.03% of the total current annual Australian GHG emissions. Santos, in its capacity as an independent company, recognises the scientific consensus on climate change assessed by the IPCC.

Direct GHG emissions expected to be generated during the proposed activity are detailed in Table 6-15. These emissions are attributable to contractors with operational control of the proposed activity and are therefore reportable under the NGER Act by these contractors. There are no Santos Scope 1 or 2 emissions associated with the activities covered by this EP; instead, these direct GHG emissions are considered Santos' Scope 3 emissions.

Emissions estimates are based on forecast fuel usage and calculated referencing the following standards and guidelines:

- Australian Government Clean Energy Regulator – *Emissions and energy threshold calculator*, Version 1.6, July 2025;

- *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (Compilation Date 1 July 2025
- *GHG Protocol*, which provides guidance on GHG estimation;
- *ISO 14064* standard for quantifying, monitoring, reporting and validating or verifying GHG emissions;
- *ISO 14040* quantitative assessment methods for assessing environmental aspects of a product or service across its life cycle stages;
- *GHG Corporate Accounting and Reporting Standard* (World Resources Institute 2004) guidance on preparing a GHG emissions inventory and the accounting and reporting of the greenhouse gases covered by the Kyoto Protocol.

The total estimated direct GHG emissions for this activity is approximately 155,986 t CO2-e. The total annual Australian GHG emissions for the year for 2023 are estimated by the Commonwealth Government to be 453 Mt CO2-e. The estimated GHG emissions from the Bedout multi-well drilling activities are estimated to be approximately 0.03% of the total annual Australian GHG emissions. The emissions from the Bedout Multiwell Exploration and Appraisal Drilling activity comprise a nominal amount in the overall scheme of national emissions and will not materially or substantially contribute to Australia's GHG emissions levels.

Santos does not consider that there are material indirect GHG emissions associated with this petroleum activity, being limited to the Bedout Multiwell Exploration and Appraisal Drilling Activity.

**Table 6-15: Estimated Direct GHG emissions over a 5-year period**

| Source | Greenhouse gasses (t $CO_2$-e) | | | Total GHG emissions (t $CO_2$-e) |
|---|---|---|---|---|
| | $CO_2$ | $CH_4$ | $N_2O$ | |
| MODU fuel usage[1] | 31,164 | 45 | 178 | 31,386 |
| Vessels[2] | 41,551 | 59 | 238 | 41,849 |
| Helicopters fuel usage[3] | 2,887 | 3 | 26 | 2,916 |
| Flaring[4] | 64,560 | 13,440 | 504 | 78,504 |
| Surveys[5] | 1,322 | 2 | 8 | 1,332 |
| **Total** | **141,484** | **13,549** | **954** | **155,986** |

*Notes:*

*[1] Assumed 7 wells at a duration of up to 110 days per well.*

*[2] Assumed 7 wells at a duration of 110 days per well. Assumes average of two vessels servicing activities.*

*[3] Assumed 3 round trips per week servicing the MODU for 7 wells at a duration of 110 days per well.*

*[4] Assumed flaring at maximum 5 of the 7 wells, with a flow duration at each well of 48 hours].*

*[5] Assumes one survey vessel at a duration of 7 days per well*

Potential impacts as a result of climate change have been modelled by Commonwealth Scientific and Industrial Research Organisation (CSIRO). Observations, reconstructions of past climate and climate modelling continue to provide a consistent picture of ongoing, long-term climate change interacting with underlying natural variability. Associated changes in weather and climate extremes—such as extreme heat, heavy rainfall, coastal inundation, fire weather and drought—exacerbate existing pressures on the health and wellbeing of our communities and ecosystems (CSIRO 2025)

Ozone-depleting substances (ODS) are used in closed refrigeration systems on board vessels. Ozone depleting substances have the potential to contribute to ozone-layer depletion if accidentally released to the atmosphere. Ozone-depleting substances are not used, generated or discharged by vessel activity other than what is incidentally located and used in closed systems on board vessels. ODS will not be deliberately released during the course the activity. ODS air emissions would only occur in the event of damaged or faulty refrigeration equipment.

#### 6.5.2.1 Cumulative Impacts

Where two MODUs operate concurrently within separate OAs, the combined emissions from fuel combustion and flaring may be released concurrently. However, the total volume of emissions generated is not expected to be greater than if the same wells were drilled sequentially. Therefore, the cumulative volume of GHG emissions remains unchanged, with no net increase in total emissions. Given the distances between OAs (more than 11 km), open offshore environment, combined with strong winds and highly dispersive oceanic conditions, atmospheric emissions are expected to disperse rapidly and widely. Potential impacts are expected to be short-term and limited to localised reductions in air quality in the immediate vicinity of the release. Given the small contribution relative to national emissions and the naturally dispersive offshore setting, no lasting cumulative or residual impacts to air quality or climate are expected.

Additionally, consultation with other operators have not identified any concurrent activities, therefore no potential additive or cumulative atmospheric emissions impacts from SIMOPS with other operators are expected to occur.

### 6.5.3 Environmental Performance Outcomes and Control Measures

EPOs relating to this event include:

- No unplanned objects, emissions or discharges to sea or air [BB-EPO-06]
- Reduce impacts to air and water quality from planned discharges and emissions from the activities [BB-EPO-07].

The control measures considered for this activity are shown in Table 6-16 with EPS and measurement criteria for the EPOs described in Table 8-2.

**Table 6-16: Control measure evaluation for atmospheric emissions**

| CM Reference No | Control Measure | Hierarchy of Controls | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Controls** | | | | | |
| BB-CM-28 | Waste incineration Management | Administrative | Reduces the potential for emissions or particulates by ensuring only permissible waste is incinerated as per International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI and Marine Order 97. | Personnel cost of maintaining waste records and training of staff. | **Adopted**<br>Negligible environmental impact outweighs the costs associated with transporting waste to shore for landfill. |
| BB-CM-29 | Fuel oil quality | Administrative | Reduces emissions through use of low sulphur fuel in accordance with Marine Order 97. | No additional costs, as this is a regulatory requirement. | **Adopted**<br>No additional costs.<br>Regulatory requirement to ensure compliance with Marine Order 97. |
| BB-CM-30 | International air pollution prevention certification | Administrative | Ensures all vessels are operating with acceptable emissions as per international standards.<br>Ensures compliance with Australian Marine Orders as appropriate for vessel class. | No additional costs, as this is a regulatory requirement. | **Adopted**<br>Benefit of ensuring vessel is compliant outweighs the costs and it is a legislative requirement. |
| BB-CM-31 | Ozone-depleting substance handling procedures | Administrative | Reduces<br>probability of potential impacts to air quality due to ozone-depleting substance emissions. | Personnel cost of maintaining ozone-depleting substance record book or recording system. | **Adopted**<br>Benefit of ensuring no ozone-depleting substance release outweighs the costs. |
| BB-CM-32 | Well test procedures | Administrative | Includes control measures that reduce the risk of poor-quality incineration of hydrocarbons | Cost associated with implementing procedures. | **Adopted**<br>High efficiency burners and gas line pilots result in more complete |

| CM Reference No | Control Measure | Hierarchy of Controls | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | entering the atmosphere.<br>Requires high-efficiency burner heads thereby improving air quality by more efficient burning or fuel combustion.<br>Gas line pilots to reduce the risk of hydrocarbons being released to air.<br>Two burner booms to be provided on the MODU to allow for redundancy and operation in all weather conditions | | combustion of hydrocarbons, reducing harmful emissions due to products of incomplete combustion and prevent unburnt hydrocarbons from being released in all weather conditions. |
| BB-CM-11 | Marine assurance standard | Administrative | Reduces emissions from vessels because equipment operating within its parameters. | Cost associated with implementing procedures. | **Adopted**<br>Benefit of implementing procedure outweighs the costs. |
| BB-CM-24 | MODU planned maintenance system | Administrative | Reduces emissions by ensuring contracted MODU is operated, maintained and manned in accordance with industry standards and regulatory requirements. | Cost associated with implementing systems. | **Adopted**<br>Benefits of ensuring vessels are maintained outweigh the costs. |
| BB-CM-25 | Vessel planned maintenance system | Administrative | Reduces emissions by ensuring contracted vessels are operated, maintained, and manned in accordance with industry standards and regulatory requirements. | Cost associated with implementing systems. | **Adopted**<br>Benefits of ensuring vessels are maintained outweigh the costs. |
| BB-CM-33 | Monitoring of support vessel(s) fuel consumption | Administrative | Active monitoring of fuel consumption informs opportunities to optimize support vessel fuel use efficiencies to reduce fuel use emissions e.g. vessel speed management depending on | Administration costs for monitoring and opportunity evaluation activities. | **Adopted**<br>Optimised support vessel fuel consumption has emissions reduction and cost reduction benefits. |

| CM Reference No | Control Measure | Hierarchy of Controls | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | operational requirements. | | |
| **Additional Control Measures** | | | | | |
| N/A | No bulk product (powder) transfers at sea, with all products loaded prior to MODU mobilisation. | Elimination | Reduces potential impacts to air quality from unintentional release. | Bulk product is required to perform the activity and transfers of bulk product are required. Given the size of the MODU, docking for quay-side loading of bulk products is not feasible. | **Not adopted**<br>Not feasible |
| N/A | No incineration policy on vessels | Elimination | Reduction in fuel consumption and air emissions through zero incineration. | Increase in health risk from storage of wastes. Limited space available to store waste and additional trips to shore would be required to transport waste.<br>Increase in risk due to transfers (increased fuel usage, potential increase in collision risk, and disposal on land impact). | **Not adopted**<br>Health and safety risks outweigh the benefit given the offshore location.<br>Cost associated with transporting waste to shore for landfill or incineration outweighs onboard incineration.<br>Incineration on the vessels (outside the 500 m temporary safety exclusion zone around the MODU) is a permitted maritime operation. |
| N/A | Removal of all ozone-depleting substance–containing equipment | Elimination | Eliminates potential of ozone-depleting substance emissions occurring, impacting on air quality. | Lack of refrigeration systems on board the vessels would lead to unacceptable workplace conditions (i.e. air conditioning) and poor food hygiene standards, limiting the vessel's ability to undertake the activity therefore there is no practical solution to the use of refrigeration. It is noted that ozone-depleting substances are rarely found on vessels. | **Not adopted**<br>Based on cost to replace all equipment and there is only a low potential for ozone-depleting substance releases. |
| N/A | Use incinerators and engines with higher | Engineering | Improves air quality by more | Significant cost in changing | **Not adopted**<br>Cost grossly disproportionate |

| CM Reference No | Control Measure | Hierarchy of Controls | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | environmental efficiency | | efficient burning or fuel combustion. | unknown vessel equipment. | to low environmental benefit (impact rated Negligible). |
| N/A | Alternative fuel type selected for vessels and MODU | Substitute | Could reduce pollutants associated with marine diesel combustion | The MODU requires support vessels for anchoring, transfer of materials / supplies during the campaign and a vessel is also on standby to provide emergency services. Alternative transfer of supplies via helicopter is not feasible due to the size of containers / bulk product being transferred. | **Not adopted**<br>Support vessels are required to undertake the activity and no alternatives are considered feasible. |
| N/A | No flaring | Elimination | Avoidance of flaring emissions and GHGs. | Not considered feasible. Flaring is required to ascertain the pressure, flow characteristics and composition of the reservoir fluids if hydrocarbons are encountered. Not flaring would present uncertainty in planning future activities. | **Not adopted**<br>Flaring is required to ascertain the pressure, flow characteristics and composition of the reservoir fluids if hydrocarbons are encountered. Flaring assists in determining future activities.<br>Flaring is required for safe operations. |

### 6.5.4 Environmental Impact Assessment

| Receptor | Consequence Level |
|---|---|
| **Atmospheric Emissions** | |
| Threatened, migratory or local fauna | Atmospheric emissions are relatively small and will, under normal circumstances, quickly dissipate into the surrounding atmosphere. Short-term behavioural impacts to seabirds could be expected if they overfly the location and they may avoid the area. This could include the seabird BIA that overlap the OAs (see Table 3-10). No decrease in local population size or area of occupancy of species, loss or disruption of critical habitat, disruption to the breeding cycle or introduction of disease.<br>Any potential impacts are not expected to result in a decrease in local population sizes or disruption to breeding cycles given the activity will occur in the open ocean and offshore waters. The consequence level is assessed I – Negligible. |
| Physical environment or habitat | The activity will occur in the open ocean and offshore waters. The quantities of gaseous emissions are relatively small and will, under normal circumstances, quickly dissipate into the surrounding atmosphere. The highly dispersive nature of local winds (i.e. strong and consistent) is expected to reduce potentially harmful or 'noticeable' gaseous concentrations within a short distance from the sources.<br>Where two MODUs operate concurrently within the separate OAs, the combined emissions from fuel combustion and flaring may be released concurrently. However, the total volume of emissions generated is not expected to be greater than if the same wells were sequentially. Therefore, the cumulative volume of GHG emissions remains unchanged, with no net increase in total emissions. Given the distances between OAs (>11 km), open |

| Receptor | Consequence Level |
|---|---|
| | offshore environment, combined with strong winds and highly dispersive oceanic conditions, atmospheric emissions are expected to disperse rapidly and widely. Potential impacts form concurrent activities in separate OAs are expected to be short-term and limited to localised reductions in air quality in the immediate vicinity of the release locations.<br>Greenhouse gas emissions will be released during the activity accounting for approximately 0.03% of annual Australian GHG emissions. Given the relatively small quantity, detectable environmental impacts are not predicted.<br>The consequence level is assessed as I – Negligible. |
| Threatened ecological communities | Not applicable – these receptors will not be impacted by air emissions. |
| Protected areas | Gaseous emissions are relatively small, will quickly dissipate into the surrounding atmosphere, and are unlikely to impact the values and sensitivities for protected areas, given the offshore environment and distances from these locations (Section 3.2). The consequence level is assessed as I – Negligible. |
| Socio-economic receptors | The activities occur in offshore waters. Atmospheric emission releases in these remote locations will not impact on air quality in coastal towns. Gaseous emissions are relatively small, will quickly dissipate into the surrounding atmosphere, and are not considered to be a potential source of impact for socio-economic receptors.<br>The consequence level is assessed as I – Negligible. |
| Worst-case consequence level | I – Negligible |

### 6.5.5 Demonstration of as Low as Reasonably Practicable

Atmospheric emissions during the activity are largely unavoidable due to operational and health and safety requirements. Standard control measures (Table 6-16) have been adopted to ensure emissions are minimised as far as reasonably practicable. Waste incineration will be undertaken in accordance with MARPOL Annex VI and Marine Order 97 requirements, ensuring only permissible waste is incinerated and prohibiting incineration within the MODU's 500 m temporary safety exclusion zone. The use of low sulphur fuel and maintenance of air pollution prevention certification for vessels and MODU further ensure emissions remain within regulated limits. Ozone-depleting substance handling procedures will be followed to reduce any risk of release, supported by record-keeping and maintenance protocols. Well test procedures require high-efficiency burner heads and gas line pilots to ensure complete combustion during flaring, thereby reducing emissions. Marine assurance standards and planned maintenance systems for both MODU and vessels will ensure equipment is operated within safe parameters, further minimising emissions through proper upkeep and compliance with industry and regulatory standards.

Monitoring of support vessel fuel consumption has also been adopted to identify opportunities to optimise fuel use, such as vessel speed management depending on operational requirements, reducing unnecessary fuel burn and associated emissions while improving operational efficiency. These measures are consistent with best industry practice and ensure that residual impacts remain negligible.

Additional controls (Table 6-16) were considered but not adopted where they were found to be infeasible or grossly disproportionate to any potential environmental benefit. Prohibiting bulk product transfers at sea was not adopted as offshore transfer is necessary for operational continuity, with quay-side loading not feasible given the MODU size and operational logistics. A complete ban on vessel incineration was also not adopted due to the associated health risks from extended waste storage offshore and the limited available space, with maritime incineration operations permitted outside the MODU exclusion zone. The removal of all ozone-depleting substance-containing equipment was not adopted as refrigeration is necessary for maintaining safe working conditions and food hygiene standards, and the likelihood of ozone-depleting substance release is already extremely low. Using engines and incinerators with higher environmental efficiency was not adopted due to the significant cost of retrofitting unknown vessel equipment relative to the negligible environmental benefit, given the already low level of emissions. Alternative fuels for vessels and MODU were also not adopted as no feasible alternatives exist for the support functions required. Finally, eliminating flaring during well evaluation was deemed not feasible, as flaring is necessary for safe operations and to ascertain reservoir characteristics critical to planning future activities, and is of short duration (24–48 hours per well).

All reasonably practicable control measures have been reviewed (Section 6.5.3) and those adopted (Table 6-16) are considered consistent with maritime/petroleum industry standards and appropriate to manage the impacts such that the residual consequence is assessed to be I – Negligible. The proposed management controls for atmospheric emissions are in accordance with the Santos risk management criteria and are considered appropriate to manage impacts to ALARP.

### 6.5.6 Acceptability Evaluation

| | |
|---|---|
| **Is the consequence ranked as I (Negligible) or II (Minor)** | Yes – maximum consequence from atmospheric emissions is I – Negligible. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' *Environmental Hazard Identification and Assessment Procedure*, which considers principles of ESD.<br>The residual consequence of the impact for this aspect is Negligible and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – pursuant to Marine Order 97 (Marine pollution prevention – air pollution), which gives effect under Australian law to Australian Marine Order 97.<br>No plans identified atmospheric emissions like those described above as being a threat to marine fauna or habitats. The activity is compliant with requirements of the *North-west Marine Parks Network Management Plan* (Director of National Parks, 2018).<br>Habitat modification from climate change is identified as a risk in a number of relevant recovery plans and conservation advice for species that may occur in the OAs (Table 3-11). Given the relatively small quantity of GHG emissions from the activity (approximately 0.03% of Australia's annual emissions), detectable environmental impacts are not predicted. |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | There were no concerns raised during consultation on the EP.<br>During the public comment period, comment was raised regarding Santos contribution to climate impacts. These matters are addressed in Section 6.5.2. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – ALARP assessment conducted, with no additional control measures adopted. |

Atmospheric emissions from vessels are permissible under the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, which is enacted in Australian waters by Marine Order 97 (Marine pollution prevention – air pollution) (which also reflects MARPOL Annex VI requirements). This is an internationally accepted standard that is utilised industry wide, and compliance with Australian Marine Order standards is considered to be an appropriate management measure in this case.

The residual consequence for this impact to the atmosphere and sensitive receptors are expected to be I – Negligible if the emissions management is adhered to and impacts from emissions that are generated by the activities are considered to be ALARP and acceptable.

# 6.6 Planned Operational Discharges

## 6.6.1 Description of Event

| | |
|---|---|
| **Event** | Potential impacts may occur in the OAs from the following operational discharges from the MODU and vessels:<br>• sewage and grey water<br>• food / putrescible wastes<br>• deck drainage<br>• cooling water<br>• bilge water<br>• brine (if reverse osmosis is used for water treatment)<br>• ballast water<br>• fire-fighting foam during routine testing.<br>**Sewage and Grey Water**<br>The volume of sewage, grey water and food waste is directly proportional to the number of persons on-board the primary and support vessels. Up to 30–40 L of sewage/greywater will be generated per person per day. Treated sewage will be disposed in accordance with Marine Order 96 (Marine pollution prevention – sewage) requirements.<br>**Food waste/ putrescible waste**<br>Putrescible waste is estimated to comprise ~1 L of food waste per person per day. Putrescible waste will be disposed in accordance with Marine Order 95 (Marine pollution prevention – garbage) requirements.<br>**Deck Drainage**<br>Deck drainage from MODU and vessels consists of rainwater, sea water and washdown water. Such discharge may potentially contain small residual quantities of oil, grease and detergents if present or used on the decks.<br>**Cooling Water**<br>Seawater may be used by some vessels as a heat exchange medium for the cooling of machinery engines. Seawater is drawn from the ocean and flows counter current through closed-circuit heat exchangers, transferring heat from the vessel engines and machinery to the seawater. The seawater is then discharged to the ocean (i.e. it is a once-through system). Cooling water temperatures may vary depending on the vessel's engines' workload and activity.<br>**Bilge Water**<br>The MODU and vessels may discharge oily water after treatment to 15 ppm via a MARPOL-approved oily water filter system. Bilge water will be disposed in accordance with Marine Order 91 (Marine pollution prevention – oil, as appropriate to class) requirements.<br>**Brine**<br>Brine generated from the water supply systems on board the MODU and vessels will be discharged to the ocean at a salinity of around 10% higher than seawater. The volume of the discharge depends on the requirement for fresh (or potable) water and will vary between the vessels and the number of people on board.<br>The effluent may contain scale inhibitors such as 'Alpacon' that controls inorganic scale formation, such as the formation of calcium carbonate and magnesium hydroxide, in water-making plants. Other water purification chemicals such as chlorine may also be added to the potable water. Other water-making plant cleaning chemicals such as 'Ameroyal' or 'Saf Acid' may be used and discharged to sea after completion of the cleaning process.<br>**Ballast Water**<br>Ballast water could potentially be discharged to the marine environment from the MODU or vessel ballast tanks.<br>**Fire Fighting Foam**<br>During routine testing that could occur during the activity aqueous firefighting foam (AFFF) could be discharged from the foam tanks over each area covered by an AFFF firefighting system. It is unavoidable that some of this foam will be discharged to sea unless it is discharged within a closed bunding system. Firefighting foam used on board the MODU and vessels will be PFAS free. |
| **Extent** | The small volumes of vessel discharges may cause localised nutrient enrichment, organic and particulate loading, ecotoxicological effects, and increased water temperature and salinity around discharge points and in the direction of the prevailing current. The environment that may be affected by vessel discharges will likely be within ~50 m of the activity vessel be contained the OAs. |
| **Duration** | During the period of the activity, localised changes to water quality will occur, however, water quality conditions will return to normal within minutes to hours of cessation of discharges. |

### 6.6.2 Nature and Scale of Environmental Impacts

**Potential receptors**: physical environment, threatened, migratory or local fauna, cultural receptors (totemic species).

#### 6.6.2.1 Physical environment

The discharge of non-hazardous wastes in small volumes into the marine environment will lead to a localised decrease in water quality. These discharges will only last for a short period of time and will be confined to the surface waters at depths of <5 m. It is expected that these discharges will disperse and dilute quickly, resulting in significant reductions in waste concentrations as distance from the discharge point increases. It is unlikely that there will be any changes to the overall water quality outside of the area where the discharges occur.

Specific potential impacts to water quality from the discharge of non-hazardous waste are as below.

##### *6.6.2.1.1 Eutrophication impacts from Sewage, Greywater and Putrescible Waste*

The discharge of food waste treated sewage, and grey water can cause localised increases in nutrient concentrations (e.g. ammonia, nitrite, nitrate, and orthophosphate), organic compounds (e.g. volatile and semi-volatile organic compounds, oil and grease, phenols, and endocrine-disrupting compounds), and inorganic substances (e.g. hydrogen sulfide, metals and metalloids, surfactants, phthalates, and residual chlorine) in the water. This could lead to elevated levels of phytoplankton and bacterial activity, potentially impacting higher-order predators in the area.

However, the low volume of these discharges is expected to disperse and dilute rapidly. Organic compounds in the discharges are subject to biodegradation and evaporation, and the high currents in the offshore waters where the discharges occur contribute to short-term changes in surface water quality within the OAs.

A study by Friligos (1985) on sewage discharge in deep ocean waters found no significant differences in inorganic nutrient levels between the outfall area and background concentrations, indicating rapid nutrient uptake and/or dispersion in the surrounding waters. Similar studies (Parnell, 2003) also reported rapid dispersion and dilution within hours of discharge.

The discharge of sewage, grey water, and putrescible wastes is not expected to impact offshore reefs, islands, shoals, banks, or marine parks.

##### *6.6.2.1.2 Salinity increases*

The desalination of seawater produces brine with a salinity ~10% higher than that of the seawater. Upon discharge, this denser brine is expected to sink and disperse with the currents. Most marine species are capable of tolerating short-term fluctuations in salinity (Walker and McComb, 1990) and thus are expected to withstand the slight increase in salinity caused by the discharged brine.

Given the low volume of discharge, minimal salinity increase, and the presence of deep, open water around the vessels, the impact on water quality in the OAs is expected to be minimal. Furthermore, the brine discharge is not anticipated to affect any offshore reefs, islands, shoals, banks, or marine parks.

##### *6.6.2.1.3 Changes in temperature*

Cooling water will be discharged into the sea at a temperature higher than the ambient seawater. However, the temperature of the discharged water will decrease rapidly as it mixes with the receiving waters. According to Woodside (2011), the discharged water will be within 1 °C of ambient levels within 100 m horizontally and will match background levels within 10 m vertically from the discharge point.

Cooling water discharge points vary for each vessel but all use a discharge design that releases cooling water above the water line. This design promotes cooling and oxygenation of the wastewater stream before it mixes with the surrounding marine environment.

The discharge of cooling water could cause temporary increases in ambient water temperature, potentially affecting physiological processes in marine organisms. However, due to the low volume and temperature differential of the discharge, along with the presence of deep, open water around the vessels, the impact on water quality is expected to be minimal and short-term.

##### *6.6.2.1.4 Contamination from release of bilge water*

The discharge of oily bilge water may result in localised reduction of water quality affecting protected marine animals and planktons. However, the water discharged will be treated to a concentration of <15 ppm before it is released, as required by Marine Order 91 (Marine pollution prevention-oil). Therefore, it is unlikely that the released bilge water will impact the receiving environment. The concentration of the discharged water in surface waters is expected to be very low, and any potential toxic effects on water quality and benthic habitats would be minimal.

#### *6.6.2.1.5 Toxicity*

Discharges from vessel systems may include chemicals from sewage, greywater, desalination processes, and residues from deck cleaning. Upon discharge into the offshore marine environment, these chemicals are expected to rapidly disperse due to their low volumes, leading to any potential impacts being confined to a localised area immediately around the discharge.

A localised and temporary reduction in water quality may occur near the release point, lasting only a few hours. However, toxicity impacts to marine fauna are unlikely due to the following reasons:

- strong ocean currents will dilute the discharge upon release, minimizing the duration of chemical exposure to marine life.
- deck cleaning products will comply with MARPOL Annex V standards for not being harmful to the marine environment.
- other potential discharges will either meet MARPOL Annex V standards, have Gold/Silver/D or E ratings through OCNS, or have undergone Santos' ecotoxicological risk assessment to ensure only environmentally acceptable products are used (see Section 2.5).
- discharges are expected to be intermittent and temporary within the OAs.

### 6.6.2.2 Sediment Quality

Wastewater discharges will occur at the sea surface facilitating rapid mixing and preventing direct interaction between wastewater plumes and the sediments within the OAs. Some discharge streams, such as sewage and putrescible wastes, may contain high loads of suspended solids. These solids could settle on the seabed, potentially impacting sediment quality.

Upon discharge into the marine environment, the decomposition of organic matter in wastewater solids is expected to begin and continue once deposited on the seabed. This may lead to slightly increased concentrations of nutrients and organic carbon in sediments, along with a minor rise in biochemical oxygen demand.

Considering the expected dilution of wastewater discharges, the settling velocity of suspended solids, the water depth in the OAs, and the currents' water movement, impacts to sediments from wastewater discharges are anticipated to be limited. These impacts include a slight increase in nutrients and organic matter, and a minor rise in biochemical oxygen demand. As a result, there may be an increase in deposit-feeding benthic biota, but any changes in fauna assemblages are not expected to affect ecosystem function. These potential impacts are considered minor.

### 6.6.2.3 Threatened or Migratory Fauna

The discharge of wastewater during the activity may affect marine fauna such as plankton, fish, marine mammals, and marine reptiles. As wastewater discharges will primarily occur near the sea surface and mix rapidly, pelagic fauna, particularly those at or near the surface, are most likely to be exposed. Larval plankton stages are particularly susceptible to increased salinity and residual chemicals in wastewater, due to their limited mobility and sensitivity (Neuparth et al. 2002). However, these organisms are expected to recover quickly once water quality returns to normal, given their high natural mortality rates and rapid replacement (International Tanker Owners Pollution Federation 2011a; Joint Group of Experts on the Scientific Aspects of Marine Pollution 1984). Consequently, the impacts on plankton are expected to be localised and minor.

Air-breathing marine fauna such as turtles, cetaceans, and seabirds are generally resistant to potential contaminants due to their impermeable skin. Therefore, no significant impacts on these species are anticipated. Fish, however, may be more vulnerable as their gills provide a large surface area for potential contaminants to be absorbed. Nevertheless, pelagic fish are transient and unlikely to remain within the discharge area for long.

Elevated water temperatures from cooling water discharges could induce minor physical stress in marine fauna and potentially result in mortality if exposure is prolonged. Elevated temperatures can alter physiological processes in marine organisms, causing behavioural responses, stress, and potential mortality (Wolanski 1994; Walkuska and Wilczek 2010).

Due to the relatively inert properties and low concentrations of residual chemicals in the wastewater discharges, along with the high level of dilution and mixing in the offshore environment, impacts to pelagic fish are expected to be limited to those experiencing prolonged exposure near the discharge source.

There is anecdotal evidence suggesting that fish aggregate around offshore petroleum infrastructure with little or no apparent impact from wastewater discharges. Mobile marine fauna are likely to move away from areas affected by wastewater discharges that could cause injury or mortality. Therefore, the potential impacts of wastewater discharges on plankton, fish, marine mammals, and marine reptiles are expected to be localised and minor. These impacts will typically be restricted to within a few hundred metres of the discharge location and are unlikely to affect the abundance and quality of commercially targeted fish species.

Overall, the potential impacts of organic enrichment from wastewater discharges (e.g. sewage) are expected to be significantly less than those associated with residual chemical discharges and localised temperature increases.

#### 6.6.2.4 Cultural Receptors

Totemic species of cultural value may pass through the OAs; however, during consultation, Santos was not made aware of any other cultural receptors within the OAs. Mobile marine fauna are likely to move away from areas affected by wastewater discharges that could cause injury or mortality.

#### 6.6.2.5 Cumulative Impacts

Where planned operational discharges occur during the activity, small volumes of sewage, greywater, food and putrescible waste, deck drainage, cooling water, brine, bilge water, ballast water and fire-fighting foam may be released into the marine environment from the MODU and support vessels in accordance with relevant Marine Orders.

If two MODUs and support vessels operate concurrently in separate OAs, these discharges may occur simultaneously rather than sequentially. However, the total volumes of planned discharges are not expected to exceed those that would occur if the same wells were drilled one after the other using a single MODU. Given the distances between OAs (>11 km), the receiving environment of deep open ocean with strong currents rapid mixing and dilution of discharges from concurrent activities is expected. Localised changes to water quality will occur only in the immediate area around each discharge point and will return to normal conditions within minutes to hours of cessation.

Therefore, concurrent activities are not expected to result in cumulative impacts to water quality, sediment quality, marine fauna, or cultural receptors.

### 6.6.3 Environmental Performance Outcomes and Control Measures

The EPOs relating to operational discharges are:

- No unplanned objects, emissions or discharges to sea or air [BB-EPO-06]
- Reduce impacts to water quality from activity vessel discharges by maintaining discharge streams in accordance with standard maritime practices [BB-EPO-08]

The control measures considered for operational discharges are shown in Table 6-17, with associated EPS and measurement criteria shown in Table 8-2.

**Table 6-17: Control measures evaluation for planned operational discharges**

| CM Reference No | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-34 | Waste (garbage) management procedure | Administrative | Reduces probability of garbage being discharged to sea, reducing potential impacts to marine fauna. Stipulates putrescible waste disposal conditions and limitations.<br>Provides compliance with Marine Order 95 (Marine pollution prevention – garbage). | Personnel cost of pre-mobilisation audits and inspections, and in reporting discharge levels. | **Adopted**<br>It is legislated requirement. |
| BB-CM-35 | Deck cleaning product selection | Administrative | Improves water quality deck drainage discharge (reduced toxicity) to the marine environment. | Personnel costs of implementing, potential additional cost, and delays of chemical substitution. | **Adopted**<br>Benefits of ensuring vessels are compliant and those deck cleaning products planned to be released to sea |

| CM Reference No | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | Those deck cleaning products planned to be released to sea meet the criteria for not being harmful to the marine environment according to MARPOL Annex V. | | meet MARPOL Annex V criteria. |
| BB-CM-36 | General chemical management procedures | Administrative | Reduces potential for inappropriate discharge of chemicals at sea through appropriate handling. | Personnel time associated with MODU and vessel inspection and implementation. | **Adopted**<br>It is a legislated requirement. |
| BB-CM-37 | Chemical selection procedure | Administrative | Improves water quality discharge (reduced toxicity) to the marine environment e.g. from AFF and potable water systems.<br>Firefighting foam used on board the MODU and vessels will be PFAS free. | Personnel costs of implementing, potential additional cost, and delays of chemical substitution. | **Adopted**<br>Benefits of ensuring MODU and vessels are compliant outweighs the cost. |
| BB-CM-11 | Marine assurance standard | Administrative | Vessels selected and on-boarded in accordance with the Santos Marine Technical Standard to ensure contracted vessels are operated, maintained, and manned in accordance with industry standards (for example, Marine Orders) and regulatory requirements (this EP) and the relevant Santos procedures mentioned in this EP. | No additional cost. | **Adopted**<br>It is a legislated requirement. |
| BB-CM-38 | Sewage treatment system | Engineering | Reduces potential impacts of inappropriate discharge of sewage.<br>Provides compliance with Marine Order 96 (Marine pollution prevention – sewage). | Personnel cost in ensuring MODU and vessel certificates are in place during vessel contracting and in pre-mobilisation audits and inspections, and in reporting discharge levels. | **Adopted**<br>It is a legislated requirement. |

| CM Reference No | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| BB-CM-39 | Oily water treatment system | Engineering | Reduces potential impacts of planned discharge of oily water to the environment.<br>Provides compliance with Marine Order 91 (Marine pollution prevention – oil). | Time and personnel costs in maintaining oil record book on the MODU and vessels. | **Adopted**<br>it is a legislated requirement. |
| BB-CM-63 | Remotely operated vehicle (ROV) inspection and maintenance procedures | Engineering | Maintenance and pre-deployment inspection on ROV completed as scheduled to reduce the risk of hydraulic fluid releases to the marine environment. | Additional personnel costs of ensuring procedures in place and followed. | **Adopted**<br>Benefits of ensuring procedures are followed outweigh costs. |
| **Additional Control Measures** | | | | | |
| N/A | Zero discharge of deck water | Eliminate | Would eliminate potential impacts of contaminants in deck drainage being discharged to sea. | Increased health and safety risks from wet deck not draining.<br>Large amounts of water on a vessel's deck can also cause stability issues (free surface effect). Storage space required for containment of drained liquids, increase in transfers to vessels resulting in increased potential impacts and risks.<br>Increased transfers results in increased fuel usage, increased safety risks to personnel during transfer (e.g. crushing between skips), increase in crane movements. | **Not adopted**<br>Safety considerations outweigh the benefit, given the small volumes of contaminants. Deck drainage is a permitted maritime practice and an important safety requirement. |
| N/A | Zero discharge of sewage | Eliminate | Would eliminate potential impacts of contaminants being discharged to sea from sewage. | Costs associated with containment and onshore disposal; space required for additional containment on MODU and vessels could create hazards for working on deck by limiting available space. | **Not adopted**<br>Safety considerations regarding containment outweigh the environmental benefit, given small volumes of contaminants. Discharge of treated sewage to sea is permitted maritime practice. |

| CM Reference No | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| N/A | Restrict use of desalination plant | Eliminate | Would eliminate potential impacts from brine discharges by importing potable water. | Costs associated with containment and onshore disposal; space required for additional containment on MODU and vessels could create hazards for working on deck by limiting available space. | **Not adopted** Safety considerations outweigh the benefit, given small volumes of contaminants. |
| N/A | Re-design desalination plant effluent discharge system | Engineering | Limited benefit to be gained, given desalination brine will be diluted. | High costs associated with modifications to MODU and vessels. May not be feasible with some vessels. Salinity difference would be minimal compared to significant cost of altering the desalination plant effluent discharge system. | **Not adopted** Cost grossly disproportionate to environmental benefit. Limited benefit to be gained, given low impact. Minimal detectable change in water quality expected. Water making and brine discharge permitted maritime practice. |
| N/A | Zero discharge of brine water | Eliminate | Would eliminate potential impacts from brine discharges by storing on-board for onshore disposal. | Cost associated with transporting waste brine water; space required for additional containment on MODU and vessels could create hazards for working on deck by limiting available space. | **Not adopted** Cost grossly disproportionate to environmental benefit. Limited benefit to be gained, given low impact. No detectable change in water quality expected. Water making and brine discharge permitted maritime practice. |
| N/A | Zero discharge of putrescible waste | Eliminate | Would eliminate potential impacts from putrescible waste discharges by storing on-board for onshore disposal. | Cost associated with transporting putrescible waste to shore, space required for additional containment on MODU and vessels could create hazards for working on deck by limiting available space. Health risks and costs associated with storage on-board and transport/disposal onshore. | **Not adopted** Cost grossly disproportionate to environmental benefit. Limited benefit to be gained, given low impact. Health risks associated with managing putrescible waste in hot weather conditions, putrescible waste discharge is a permitted maritime practice. |
| N/A | Do not test AFFF containing firefighting equipment on | Eliminate | Would eliminate the discharge of the small | Increased safety risk due to potentially untested AFFF | **Not adopted** Safety considerations outweigh the |

| CM Reference No | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | MODU and vessels. | | quantities of AFFF. | system. Inability to fight fire affectively. | environmental benefit given. |

### 6.6.4 Environmental Impact Assessment

| Receptor | Consequence Level |
|---|---|
| **Operational Discharges** | |
| Threatened, migratory or local fauna | Planned operational discharges have the potential to locally decrease water quality and alter marine fauna behaviour. Sensitive receptors that could be impacted include surface-dwelling fish, marine turtles, mammals, and seabirds. The OAs overlap several BIAs including whale shark foraging BIA and migratory birds (reproduction BIA) as detailed in Table 3-10. A pygmy blue whale migration BIA lies ~9 km beyond the Currie OA (Figure 3-10). While the marine fauna may transit through the OAs, contact with operational discharges are unlikely to result in impacts greater than a short-term behavioural change, limited to one or a few individual species.<br>Water quality impacts will be localised to the discharge mixing zone and will persist only as long as the discharges continue, with recovery expected within hours to days. Consequently, only short-term behavioural impacts are expected, with no significant reduction in local population sizes, species' area of occupancy, habitat loss, disruption of critical habitats, disruption to breeding cycles, or disease introduction.<br>Given the nature of the planned operational discharges, the relatively small volumes released to the marine environment, the high levels of dilution and the nature of the marine environment near the OAs, the consequence level for threatened, migratory or local fauna is considered to be I – Negligible. |
| Physical environment or habitat | Water quality changes will be highly localised and are not expected to persist following cessation discharge.<br>If two MODUs and support vessels operate concurrently in separate OAs, these discharges may occur simultaneously rather than sequentially. However, the total volumes of planned discharges are not expected to exceed those that would occur if the same wells were drilled one after the other using a single MODU. Given the distances between OAs (>11 km), the receiving environment of deep open ocean with strong currents rapid mixing and dilution of discharges from concurrent activities is expected. Localised changes to water quality will occur only in the immediate area around each discharge point and will return to normal conditions within minutes to hours of cessation.<br>Given the nature of the planned operational discharges, the relatively small volumes released to the marine environment, the high levels of dilution and the nature of the marine environment near the OAs, the consequence level for physical environment or habitat is considered to be I – Negligible. |
| Socio-economic receptors | Given the negligible consequence to species due to the controls in place to manage the discharges in accordance with regulatory requirements, subsequent impacts to socio-economic receptors and cultural features (including species with cultural significance as totems or as a cultural food source) are not anticipated. |
| Threatened ecological communities | Not applicable – No threatened ecological communities identified in the area over which operational discharges are expected. |
| Protected areas | Not applicable – No protected areas are identified in the area over which operational discharges are expected. |
| Overall worst-case consequence | I-Negligible |

### 6.6.5 Demonstration of as Low as Reasonably Practicable

The MODU and vessels are essential for undertaking the activity, and while an alternative to discharging small amounts of liquid waste to the marine environment would be to store and transport waste to shore for disposal, this option presents greater environmental and operational risks. Transporting waste to land would increase emissions through additional vessel movements, energy use, and road transport impacts, as well as raise collision risks from increased vessel traffic. Containment of discharges on-board without significant modifications would reduce deck space, pose safety hazards, and increase lifting operations. Therefore, treatment and controlled discharge of waste in accordance with industry standards and regulatory frameworks, including the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and MARPOL Annexes IV, V, and I, is considered the most environmentally sound approach.

A number of standard control measures (Table 6-17) have been adopted to ensure waste management is robust and compliant. These include the implementation of waste management procedures, deck cleaning product selection aligned with MARPOL Annex V, chemical handling and selection procedures, marine assurance practices, and use of certified sewage and oily water treatment systems. All vessels and the MODU will maintain compliance with Marine Orders 95, 96 and 91. These controls ensure that discharges are appropriately treated to minimise environmental harm, and the small volumes of waste released are within acceptable and legislated limits.

Additional control measures (Table 6-17) were considered but not adopted where the cost, technical feasibility, or health and safety implications were grossly disproportionate to any minor environmental benefit. Measures such as achieving zero discharge of deck drainage, sewage, brine, and putrescible waste were not adopted as containment on-board would significantly increase safety risks, such as deck instability and worker exposure to health hazards. Similarly, redesigning desalination plant systems and restricting their use was deemed infeasible given the minimal environmental benefit and substantial modification costs. Prohibiting routine testing of AFFF firefighting systems was also not adopted due to the unacceptable risk of equipment failure in emergencies. All discharges will comply with accepted maritime practices, and impacts are expected to be minor and temporary.

All practical control measures have been reviewed (Section 6.6.3), and those adopted, as detailed in Table 6-17, are considered appropriate to manage the impacts such that the residual consequence is assessed to be I – Negligible and cannot be reduced further. The proposed management controls for planned operational discharges are in accordance with the Santos' risk management criteria and are considered appropriate to manage the risk to ALARP.

### 6.6.6 Acceptability Evaluation

| | |
|---|---|
| **Is the consequence ranked as I (Negligible) or II (Minor)** | Yes – maximum consequence from planned operational discharges is I – Negligible. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with *Santos' Environmental Hazard Identification and Assessment Procedure*, which considers principles of ESD.<br>The consequence against this aspect is I – Negligible and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – management consistent with the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983,* which in Australian waters is enacted by the Marine Orders.<br>No contact with sensitive habitats or protected areas predicted. Control measures implemented will reduce the potential impacts from operational discharges to species identified in relevant species recovery plans, conservation advice, wildlife conservation plans and other management plans/guidelines set out in Table 3-11.<br>Pollution is identified in a number of plans but pertains to more toxic discharges and therefore is not considered applicable here given the discharges are allowable in accordance with legislation or are of low toxicity. |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | No concerns were raised during consultation on the EP,<br>During the public comment period, comment was raised regarding discharge impacts to the environment. Santos considers these matters are appropriately addressed in Section 6.6.3, |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

Release of non-hazardous discharges into the sea from MODU and vessels in Australian waters is permissible under the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, which in Australian waters reflects Australian Marine Orders requirements.

The operational discharges are not expected to significantly impact the receiving environment given the management controls proposed, including compliance with all relevant Marine Orders requirements. The Marine Orders are considered to be the most appropriate standard given that the nature and scale of the events is expected to reduce the potential for environmental impacts to a level that is considered ALARP and environmentally acceptable.

# 6.7 Drilling Discharges

## 6.7.1 Description of Event

| | |
|---|---|
| **Event** | Potential impacts may occur in the OAs from:<br>• drilled muds and cuttings<br>• lost circulation materials (LCM)<br>• cement<br>• residual drilling fluids<br>• tank cleaning residue<br>• subsea discharges (e.g. ROV)<br>• blowout preventor control fluid<br>• formation water during well testing/evaluation<br>• other miscellaneous chemicals and additives such as tracers, dyes and cement spacer.<br>Normal ROV operations and valve actuation can result in small releases directly to the marine environment. Unplanned discharges (i.e. minor hydrocarbon release) from the activity are covered in Section 7.8.<br>During the activity, the following estimated and approximate discharge volumes could be expected for each well:<br>• 300–1,000 $m^3$ of drill cuttings discharged to seabed (riserless surface hole section)<br>• 150–650 $m^3$ of WBM based drill cuttings discharged at sea surface (remaining well sections)<br>• 900–2,500 $m^3$ of water-based drilling fluids discharged at sea surface<br>• 1,900–3,500 $m^3$ of seawater/gel sweeps/mud discharged at seabed (riserless surface hole section)<br>• 450–800 $m^3$ of brine<br>• ~60 $m^3$ of cement (wet) discharged to seabed<br>• <15 $m^3$ of cement (wet or set) discharged at sea surface (i.e. cement spacer, flushing tanks and lines)<br>• 100 $m^3$ of cement (wet) discharged at sea surface or 250 $m^3$ at the seabed in the event of a cement job not meeting technical and safety standards<br>• aqueous-based LCM may also be pumped downhole at times.<br>• 70 $m^3$ each of stock cement/bentonite/barite/brine as slurry at the end of the well in the event the stocks cannot be re-used/sold.<br>• tracer dyes may also be used during cementing operations and for equipment leak detection<br>• ~20–200 L of hydraulic fluid per BOP function (volume required varies on function) required after installation of the BOP<br>• ~10–15 t dry cement or bentonite in the event dead-space volumes in silos cannot be mixed into slurry.<br>Cutting discharge volumes are calculated based on the expected wellbore section sizes and lengths and include some contingency. The total volume of drilling fluid and cement is an estimate based on previous drilling and completion programs. There are many variables during drilling campaigns that could cause the abovementioned volumes to change; for example, re-spud or side-tracking could be required and/or the interval length could change. Some of these variations could cause the estimated discharge volumes to increase or decrease, in particular the need for re-spud or side-track.<br>Any formation water produced during well flowback would be discharged to the marine environment following oil filtration. The volume of formation water is expected to be low, but volumes depend on well performance and reservoir properties. The discharge will be limited to the duration of the well flowback.<br>Santos intends to keep unmixed bulk cement, barite, bentonite, and brine on-board the MODU at the end of drilling. In the event that the well is the final in the MODU schedule, these substances will be handled according to the decision list in Table 6-18. |
| **Extent** | Drilling discharges with larger particle sizes such as large drill cuttings are expected to settle directly around the MODU and wells, whereas discharges with finer particles could be carried with prevailing currents before settling.<br>The seabed area affected by drill cuttings is expected to be localised with the higher concentration of cuttings in the immediate vicinity of the wells. Turbidity from drilling-related discharges is expected to affect water quality near the MODU periodically during drilling. |

| | |
|---|---|
| | Well flowback discharges including formation water are expected to dissipate rapidly and be diluted within the OAs. |
| **Duration** | Water quality changes are expected to recover within hours to days following cessation of drilling discharges.<br>Sediment deposition will occur during the activity, with finer particles continuing to settle for approximately two weeks following the drilling activity, with ecological recovery of the benthic habitat expected within months to a year. |

#### 6.7.1.1 Drilling muds and cuttings

The Activity is planned to use WBM for all hole sections.

WBM and cuttings will be discharged at the seabed for the riser-less top-hole sections of the well. Once the surface casing, high pressure riser and BOP are installed, thereby establishing a closed circulating system, the remainder of the well will be drilled with a weighted brine/shale inhibited drilling fluid.

Cuttings produced during drilling with the riser in place will be discharged from the MODU following treatment by the solids control equipment (described further below). While much of the drilling fluid will be recovered by the solids control equipment, residual drilling fluids will be discharged with the cuttings. The WBM will be discharged from the MODU at sea surface from surface storage tanks/mud pits when no longer required.

The WBM will be comprised of water or brine (>90% aqueous) as the major liquid phase. The remainder of the WBM will be made up of low toxicity drilling fluid solid additives (e.g. barite) and chemicals that are either completely inert or additives in such low concentrations they pose little or no risk to the environment.

As detailed in Section 2.5, the fluids and components of the drilling and completion fluids will be selected in accordance with the *Santos Drilling Chemical Selection and Approval Process* to ensure that environmentally acceptable products are used or the risks can be demonstrated to be ALARP from the use of other chemicals

The wells will be drilled in sections or intervals (e.g. top hole, surface, intermediate and bottom). The top hole and surface sections will be drilled riserless, with all cuttings and fluids discharged directly to sea at the wellhead.

The remaining well sections will be drilled with a closed loop circulating system with all drilled solids and well returns managed via the MODU solids control equipment. Drill cuttings will typically be removed via shale shakers and centrifuges (as required) and discharged to sea surface. WBM fluids will be re-circulated downhole, stored for future if practicable, or discharged to sea surface if no longer required. Shale shakers are comprised of a series of vibrating shaker screens.

Centrifuges may be used to remove ultra-fine solids in the recovered drilling fluid (i.e. once surface hole section casing installed). The ultra-fine solids are detrimental to the drilling fluid properties due to increased surface area and reactivity. Centrifuges do not process all the well returns. Given the large volume, it is not practicable to centrifuge the entire drilling fluids system. Hence, a portion of the drilling fluid recovered from the shakers may be sent to the centrifuges where the higher G-forces facilitate removal of finer particles.

#### 6.7.1.2 Lost circulation material

Lost circulation can occur in any hole interval and varies in severity. Lost circulation occurs when the drilling fluid flows into natural geological fissures, fractures or caverns. In the surface interval, when drilling riserless, it is often not necessary to take any action to cure the losses as they often self-cure once sufficient cuttings have entered the loss zone.

For losses that have to be cured, there is a choice of options available. Conventional LCM additives such as granular and fibrous material are usually pumped into the loss zone in the first instance. When conventional LCM additives fail to plug the loss zones it may be necessary to pump speciality lost circulation additives, such as cement or cross-linked polymers to heal the loss zones. By design the LCM enters the loss zone thereby plugging it and allowing drilling operations to re-commence. Typically, the LCM additives remain in the subsurface loss zone and do not return to surface. On some occasions the lost circulation is cured before all the material pumped enters the loss zone. When this occurs, the lost circulation material remains in the wellbore until it is usually circulated back to the surface where it is discharged along with the cuttings.

#### 6.7.1.3 Cement

Cement will be used to form permanent barriers and fix casings in place before drilling ahead with subsequent sections in the well. Cement in the annular space between casing and formation will form a seal to ensure the circulation system remains closed. Cement may also be used to seal a lost circulation zone, plug the wells from which a sidetrack may be drilled and when abandoning the wells.

The majority of cement pumped remains downhole, but minor volumes may be discharged at the seabed (when cementing the conductor or surface casing) or at surface (when flushing lines or tanks). Some cement may be

mixed and dumped as part of cement unit commissioning prior to the start of a campaign if the cement unit/pump has not been used before or in a considerable period of time.

During cementing operations, surface cementing equipment and lines will need to be flushed, washed and cleaned with water to prevent hard setting. The residual cement and wash water will be discharged to sea after each cement job.

Tracer dyes may be used during cementing operations for detection purposes. While transferring dry bulk cement, minor solids will be vented to air to prevent tank over-pressuring.

#### 6.7.1.4 Residual drilling fluids

The conductor and surface hole sections will be drilled with seawater and pre-hydrated gel sweeps. These fluids will be mixed and blended on the MODU and stored in the surface mud storage tanks, or mud pits, until they are pumped downhole and discharged directly to the sea (top hole to seabed and surface hole from the conductor at sea level). Excess sweeps and mud will be retained in the surface mud pit system, in the event that it is required to be pumped while running surface casing. Once the surface casing is run and cemented, surface residual volumes will be discharged, due to incompatibility with the subsequent fluid system, to marine environment. The fluid would be discharged at the sea surface from the mud pit.

Once the surface casing string is installed, a drilling fluid system will be maintained until well total depth (TD). This mud system will be mixed and blended on the MODU and stored in the mud pits until pumped downhole and recycled via the conductor to the MODU continuously, assuming there are no sub-surface loss zones.

Consumed drilling fluid volume will be replenished as required to reach TD. Once TD is reached, and the well has been completed, residual WBM drilling fluids will be discharged to sea from the mud pit unless they can be used on a subsequent well.

#### 6.7.1.5 Tank cleaning residue

At stages during the activity, tanks may need to be cleaned, including mud pits (i.e. tanks used to mix and hold brine, sweeps or WBM), cement mixing/holding tanks and bulk storage tanks. Cleaning may be required to remove or flush ‘dead’ or residual volumes of WBM or settled inert solid material. The cement system will need to be flushed to prevent curing inside the cement unit and pipework after each cement job is completed. In most instances, tanks and pipework would be flushed with seawater or drill water and the diluted fluid discharged to sea surface.

#### 6.7.1.6 Blowout preventor control fluid discharges

A BOP will be installed before drilling the production hole sections. The BOP will be routinely checked by completing pressure and function testing. Each function test will release control fluid (~60–600 L) to the marine environment. The control fluids are subject to the *Santos Offshore Division Drilling Chemical Selection and Approval Process* described in Section 2.5.

#### 6.7.1.7 Formation water

Formation water which may be produced from the reservoir during well flowback (as described in Section 2.4.8) and discharged to sea. This will notionally take 24–36 hours pending well and surface process conditions. The non-flammable completion fluids and produced water will be treated via a water treatment package to reduce the oil-in-water content to <1% by volume before discharge to sea. Other chemicals such as methanol and MEG may also be injected into the flow stream and either flared or discharged to sea.

Water that has been condensed from the steam used to heat the fluids via a steam exchanger in the well flowback package will also be discharged to sea. It is estimated that ~100 $m^3$ of heated water at a notional temperature of 60 °C could be discharged to sea per well flowback. The discharge rate would be notionally 2–3 $m^3$ per hour.

#### 6.7.1.8 Bulk products

Once the well has been completed, or during an emergency (e.g. cyclone avoidance), unmixed bulk drilling fluid solid additives (barite and bentonite), dry cement and brine will be managed in accordance with the decision framework in Table 6-18. Where possible, residual dry bulks will be mixed into a slurry for discharge. However, with dead volumes in silos, it is often not possible to mix the remaining 10–15 MT per silo. In these instances, and where all other options have been exhausted per Table 6-18, then compressed air will be used to vent the dry bulk overboard. The only other alternative would be to have personnel enter the silo (confined space) and manually remove the bulk, which presents an increased risk to personnel safety.

**Table 6-18: Decision framework for managing bulk powders[8] remaining on the MODU at the end of the development/activity.**

| Trigger | Fate of Stock | Reasoning |
|---|---|---|
| Well is not the last well in the MODU schedule and ongoing use of the product is anticipated. | **Retain stock**<br>Stock will be retained on-board for use in the next well or may be sent for temporary storage on a supply vessel.<br>This option eliminates overboard disposal. | These products are expensive. Santos' preferred option is to use all stock in subsequent wells in the MODU schedule to minimise activity costs and reduce discharges. |
| Well is the last well in the MODU schedule and the next Operator is willing to buy the stock. | **Sell stock**<br>Stock will be retained on-board or may be sent for temporary storage on a supply vessel for used by the next Operator.<br>This option eliminates overboard disposal | It may be possible for Santos and the next Operator using the MODU to transfer ownership of the unmixed stock. The implementation of this option is dependent on demand and commercial agreements. |
| Well is the last well in the MODU schedule and selling the stock to the next Operator is not an option. | **Minimise stock**<br>Santos will have measures in place to reduce the stock requiring disposal at the end of the activity.<br>This option requires some overboard disposal. | Stock minimisation measures will be put in place without compromising the minimum bulk stock required for well control or dealing with lost circulation. |
| Well is the last well in the MODU schedule, selling the stock to the next Operator is not an option but another Santos operated MODU is in proximity and can take on stock. | **Transfer stock to alternative MODU**<br>This option eliminates overboard disposal. | Stock can be transported to an alternate MODU dependent on:<br>• whether MODU is capable of transferring dry bulk products back to support vessel<br>• whether Santos has another MODU operating in the region<br>• alternative MODU can use the product<br>• travel distance and cost associated with transporting the stock to the alternative MODU are not prohibitive<br>• alternate MODU has the capacity to take on additional stock. |
| All other disposal options have been exhausted. | **Overboard disposal of stock**<br>Stock will be discharged as wet slurry. | Disposal volumes will be minimal due to stock minimisation.<br>A decision log will be prepared demonstrating that this disposal option is ALARP and acceptable. |

### 6.7.2 Nature and Scale of the Environmental Impacts

**Potential receptors**: water quality, sediment quality, benthic habitat, marine fauna, cultural receptors (totemic species)

Drilling discharges will be intermittent during the activity. Their discharge to the marine environment, particularly discharges from the MODU, will result in a localised reduction in water and sediment quality, and smothering of benthic habitats.

#### 6.7.2.1 Water Quality

Drilling solids (i.e. cuttings), cement and solid additives (e.g. barite, bentonite) will be discharged during the activity. Drill cuttings and retained drilling fluid discharges are expected to increase turbidity and TSS levels above ambient

[8] *Bulk powders include any of the following: barite, bentonite and cement*

concentrations above the seabed (top-hole well sections) or in the upper surface layers (bottom-hole well sections with discharge below the water line from the MODU).

Conductor and surface well sections will be drilled riserless, hence drill cuttings and drilling fluids (WBM) will be discharged at the seabed. The relatively coarse material (drill cuttings) will deposit on the seabed and the finer sediment material (the WBM) will cause localised elevated TSS in the water column above the seabed surrounding the well. This reduction in water quality will be temporary (limited to the operational discharges during drilling) and subject to rapid dispersion and dilution by prevailing seabed currents.

During bottom-hole well sections, when drill cuttings with retained drilling fluids are discharged below the water line (from the MODU), the larger particles, representing about 90% of the mass of the solids form a plume that drops out of suspension in the water column rapidly and, deposits on the seabed.

About 10% of the mass of the solids (the fines predominately composed of drilling fluid) form a plume in the upper surface layer (depending on the depth of discharge from the MODU) that will be transported by prevailing currents away from the MODU and is diluted rapidly in the receiving waters (Neff, 2010, 2005), as shown in Figure 6-2. Jones et al. (2021) found >95% of drill cuttings from wells comparable to Bedout wells were >1 mm in size, with the modelled and observed deposition zone for most cuttings being roughly circular. These findings are consistent with other results, such as Bakke et al. (2013) and Rye et al. (2006).

Cuttings with adhered fluids discharged from the MODU will dilute rapidly, with dilution of the drilling cuttings and fluid plume by a factor of at least 10,000 within 100 m of the discharge point (Neff, 2005). Further to that, Neff (2005) states that in well-mixed oceans waters, the plume is diluted by >100-fold within 10 m of the discharge site.

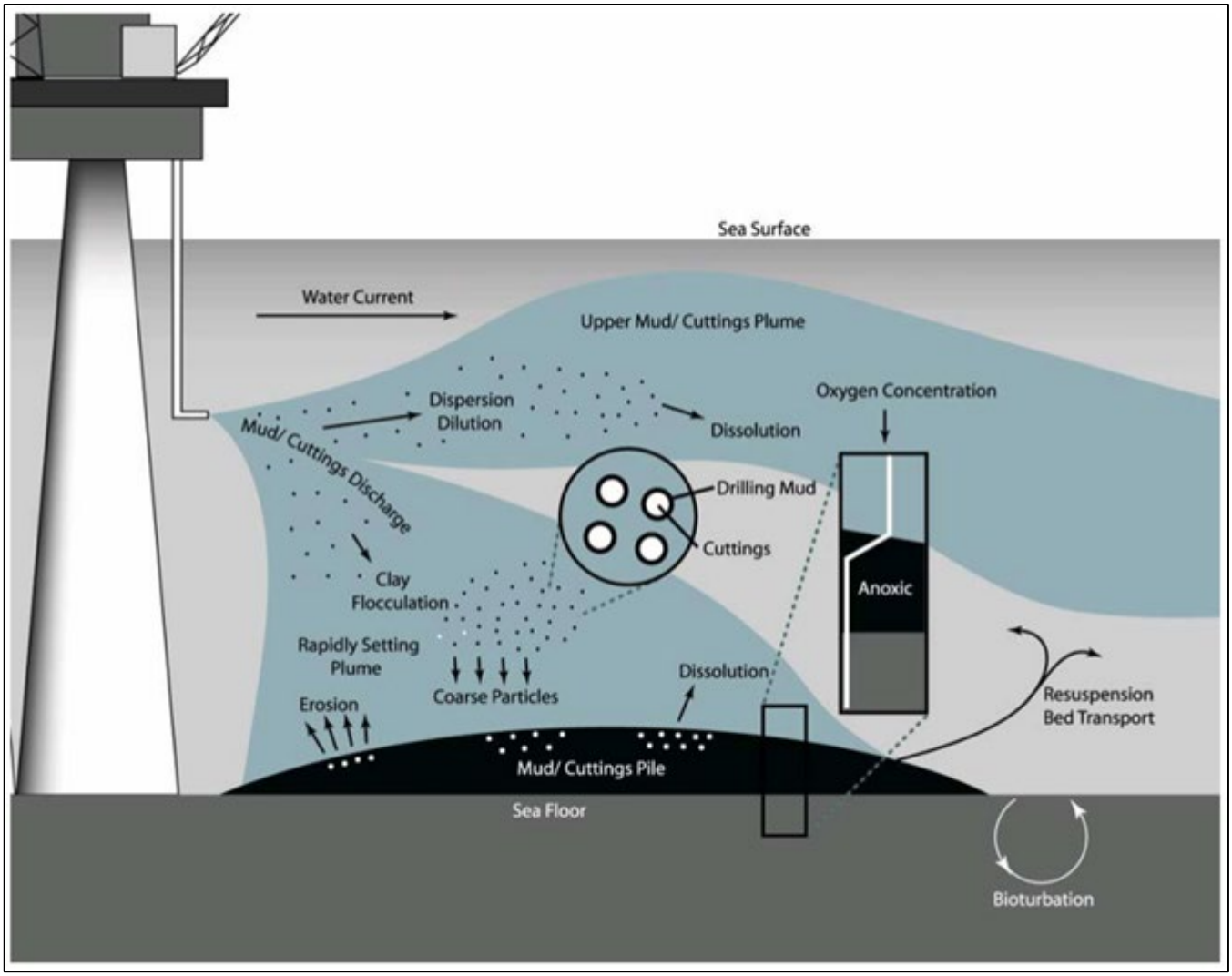



**Figure 6-2: Conceptual model for the dispersion of WBM following discharge in the sea**

*Source: from Neff (2005)*

Bulk discharge of WBM from the mud pits on the MODU, such as at the completion of drilling a section of the well, will result in a turbid plume extending from the discharge location. Unlike the discharge of drill cuttings, bulk discharge of WBM consists of liquids such as seawater or brine and fine solids such as clay-sized particles. The duration of bulk WBM discharges is typically much shorter than the discharge of drill cuttings. Bulk mud discharges will be denser than the receiving seawater and the resulting plume will be negatively buoyant. The plume is

expected to turbulently mix as it billows and sinks towards the seabed. Jones et al. (2021) modelled and measured bulk discharges of WBM from drilling activities on the NWS and found intermittent pulsed total suspended solids concentrations of 10 mg/L could occur up to 1,000 m from the discharge location. For context, transient peak total suspended solids from the passage of cyclones and storms in tropical shallow water can exceed hundreds of milligrams per litre for a few hours (Abdul Wahab et al., 2017; Fisher et al., 2015). Hence, the turbidity caused by the bulk discharge of WBM will be comparable to natural turbidity pulses within hundreds of metres of the discharge location and will be limited to discrete pules of turbidity during bulk discharges.

Discharges of formation water may be required during well clean-up. Formation water will be treated by the water treatment equipment onboard the MODU to reduce oil in water concentrations to <1% by volume and the volume will be limited to that required to complete the well clean-up.

The increase in total suspended solids in the water column due to the discharge of drill cuttings and fluids will reduce the penetration of light through the water column. Insufficient photosynthetically active radiation (PAR) reaches the seabed in the operational area to support benthic primary producer habitats (macroalgae, seagrasses, zooxanthellate coral etc.). Photosynthetic plankton may receive less PAR due to the increase in turbidity, resulting in a localised, short-term decrease in planktonic primary production.

Increased total suspended solids may also impact upon filter feeding organisms due to clogging of feeding apparatus. Pulses of increased turbidity occur naturally in the region and biological communities are adapted to, and constrained by, turbidity gradients in the region (Moustaka et al., 2018). Filter feeders in the water column include many planktonic fauna, such as copepods, which may experience a decrease in abundance due to impacts from increased total suspended solids. Planktonic communities are widely represented and have been shown to recover rapidly from disturbance, with large-scale oceanographic features driving much of their population dynamics (McKinnon et al., 2003).

Plumes of discharges drilling fluids may induce toxic effects due to chemicals in residual drilling fluids and contaminants from the cuttings. The potential for toxic effects is low given the rapid dilution of drilling fluids and cuttings and the chemical selection process which preferences low toxicity drilling additives.

The increase in turbidity near the seabed from discharge of drill cuttings and fluids will be relatively localised compared to the plume in the water column. Benthic filter feeders impacted by increased total suspended solids will be limited due to adaptation to naturally high pulses of turbidity but will be impacted by smothering from deposited cuttings and fluids (discussed below).

Residual fluids on drill cuttings may increase the biological oxygen demand due to microbial degradation of organic compounds. This effect will be negligible in the water column due to the well mixed and highly oxygenated water column in the OAs.

Discharged formation water will have potential toxicants from the reservoir, such as residual hydrocarbons, dissolved solids (including metals) and nutrients. Formation water is typically warmer than the receiving waters and discharged near the sea surface and will mix with the receiving seawater. Toxicants in formation water may induce acute toxic effects in planktonic organisms within the plume, with the potential for toxic effects diminishing at the plume dilutes. Nektonic fauna, such as fishes, are expected to avoid the plume and hence are unlikely to experience toxic effects. Modelling and monitoring of produced formation water discharges from production facilities show that continuous discharges of relatively large volumes of produced water mix rapidly (Barnes et al., 2019). Harmful effects in the water column from such discharges are typically restricted to within several hundred metres of the discharge point (Barnes et al., 2019).

The impacts to water quality described above are short-term, restricted in spatial extent (i.e. within plumes), and recovery to natural conditions will occur within hours to days after discharges cease.

#### 6.7.2.2 Sediment Quality

The accumulation of cuttings will physically modify the sediments by modifying the particle size distribution. These cuttings will be largely comprised of cuttings that are relatively coarse compared to natural sediments. Coarse deposited sediments are unlikely to be resuspended by currents but may be distributed as bedload by high energy weather events such as cyclones. Finer sediments deposited further will likely be reworked by currents and transported as bedload or suspended sediments by tidal currents.

The residual WBM includes drilling fluid components such as metals – predominantly barium, a component of the commonly used weighting agent, barium sulphate – as well as residual organic matter. Drilling fluid components for WBM are selected to have a low toxicity and hence pose little impact to sediment quality. Residual organic material, such as guar gum, may support microbial degradation, which can result in temporary depletion of oxygen within the drill cuttings pile, although this is unlikely to impact upon biota as most biota under the cuttings pile will be lost from smothering.

The processes of bioaccumulation, bioconcentration and biomagnification may result in increased concentrations of potential toxicants in organisms. These processes occur when substances accumulate in an organism faster than they can be eliminated (e.g. through prey species or from the abiotic environment). An extensive review by Gray

(2002) found that biomagnification was less common in marine systems than terrestrial system, with many studies failing to show biomagnification (although may showed bioaccumulation – increased concentrations within an organisms during its life). Of the metals, Gray (2002) concluded that only organic mercury biomagnifies in food webs (particularly in lipids), with other metals being regulated and excreted. Mercury may be present in barite (barium sulphate) in the form of inorganic and insoluble mercuric sulphide, with concentrations varying substantially depending on the geological origin of the barite. The forms of mercury in barite have very low bioavailability, much lower than methylmercury, and pose little risk of biomagnification (Neff, 2008). The *Santos Offshore Division Drilling Chemical Selection and Approval Process* preferences chemicals with low potential for toxicity and bioaccumulation. As such, biomagnification of toxicants to harmful levels is not considered credible.

#### 6.7.2.3 Benthic Habitat

The discharge of drill cuttings and residual fluids has the potential to impact benthic communities, largely due to physical and chemical changes to sediments and water quality described above.

Particularly, burial and smothering of benthic habitats from the discharge of drill cuttings will impact upon the existing benthic habitats at the drilling location. A review by Smit et al. (Smit et al., 2008) determined the hazardous concentration for 5% for burial effects on epifauna was 6.5 mm. Hence, burial depths less than this are unlikely to result in substantial changes to epifauna communities. The cuttings pile may reach a thickness of up to 1 m around the wellhead and below the MODU cuttings discharge point, however this thickness rapidly reduces away from these discharges. Recent modelling commissioning by Santos for the Spartan development (similar cuttings volumes and metocean conditions) indicated the thickness of deposition would be ~3 mm within 175 m of the discharge location, with cuttings distributed along the predominant current vector (RPS, 2021). Given the localised area within which benthic communities would be impacted by smothering and the widespread nature of the benthic habitats and communities that would be lost, the loss of benthic habitats due to smothering is negligible.

Sessile benthic fauna and infauna within this deposition footprint may experience smothering that may result in mortality. The recovery of the area subject to deposition ≥10 mm thickness will potentially take many years, depending on natural sedimentary processes. Recovery may be linked to the deposition of relatively fine natural sediments on the coarse sediments in the cuttings pile to create suitable habitat. Studies of the recovery of benthic communities on visible cuttings piles – consistent with the area subject to drill cuttings and fluids deposition ≥10 mm – indicated considerable recovery within three years, particularly where deposition was thinner; however, the benthic communities had not yet recovered to be similar to pre discharge conditions or the surrounding unaffected seabed (Gates and Jones, 2012).

Benthic communities subject to deposition between 1 mm and 10 mm thickness are less likely to experience mortality but may experience sublethal impacts, such as impaired feeding due to clogging of filter feeding organs and increased energy expenditure from removing sediment from burrows (IOGP, 2016). Recognising sediment deposition from drill cuttings and fluids is in addition to natural processes, benthic communities subject to deposition of drill cuttings and fluids of <1 mm thickness are unlikely to experience impacts from physical deposition of cuttings, as this thickness is consistent with natural sedimentary deposition rates.

Increased turbidity near the seabed due to the discharge of drilling fluids and cuttings is not expected to result in substantial impacts to benthic fauna beyond those caused by smothering. Near-bottom waters in the region naturally vary in turbidity. High energy metocean events, such as cyclones, can result in elevated levels of turbidity, to which the benthic communities are naturally adapted. Studies by Smit et al. (2008) found benthic biota were relatively insensitive to increased turbidity from drilling fluids and cuttings, particularly compared to planktonic biota.

Changes in sediment chemistry may impact upon benthic communities, particularly changes in oxygen demand from biodegradation of organic compounds in residual drilling fluids. Trannum et al. (2010) examined the effects of cuttings with residual WBM and found a significant reduction in abundance and diversity of benthic infauna as cuttings thickness increased, compared to natural sediment, and suggested changes in sediment chemistry were a significant factor. Increased oxygen demand resulting from aerobic degradation of organic compounds in the WBM were suggested as a cause, along with fluxes in silicon and phosphorous (Trannum et al., 2010). The effects at low sediment thickness (<10 mm) were much less apparent than relatively high rates of burial. These results are consistent with findings from other investigations of potential impacts of WBM (Smit et al., 2006). The increased oxygen demand will diminish over time as organic material is consumed and will approach natural conditions.

#### 6.7.2.4 Marine Fauna

There are a range of marine fauna in the region, including cetaceans, marine reptiles, pelagic and demersal fishes, and seabirds (Section 3.2.6). These may be exposed to drilling discharges, potentially resulting in physical and behavioural effects. Impacts to sessile benthic fauna and infauna are considered above.

There are no known benthic habitats or features in the OAs that would result in the aggregation or occurrence of site attached marine fauna. Several BIAs overlap the OAs (Table 3-10), however they extend considerable distances away from the OAs and species are expected to be transitory. In addition, marine fauna found in the

water column, such as fish, marine mammals and marine reptiles, are expected to actively avoid discharge plumes and associated turbidity and toxicity within the water column.

The Mestrel/Bancroft OA is directly adjacent to the reproduction (internesting buffer) BIA for flatback turtles (Figure 3-17). *The Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017) identifies habitat modification as a threat to marine turtles. However, reproduction activities for flatback turtles typically occur in shallower waters than those found in the OAs (Pendoley Environmental Pty Ltd, 2017; Whittock et al., 2016). If a marine turtle were displaced by seabed and benthic habitat disturbance, ample reproduction habitats are available nearby within the identified BIA. Thus, marine turtles could continue to use these critical areas for reproduction, and no loss or disruption of essential habitat or interference with their breeding cycle is expected.

#### 6.7.2.5 Cultural Receptors

Totemic species of cultural value may pass through the OAs; however, during consultation, Santos was not made aware of any other cultural receptors within the OAs. Any totemic species (e.g. marine fauna & reptiles) found in the water column are expected to actively avoid discharge plumes and associated turbidity and toxicity within the water column.

#### 6.7.2.6 Cumulative Impacts

If an exploration well is successful, it is possible that an appraisal well could be drilled near-by to the successful exploration well. Impacts to the seabed may occur within a previously disturbed area from cuttings (cuttings from drilling of an exploration well). Further discharge of cuttings over the already disturbed cuttings piles if an appraisal well was to be drilled in close proximity to an exploration well are not considered to pose significant impact other than smothering of benthic fauna already recolonising the area (impacts discussed above).

Where two MODUs operate concurrently in separate OAs, the combined drilling discharges may occur at the same time rather than sequentially. However, the overall total volumes of cuttings and other drilling discharges will not increase, as the same number of wells would otherwise be drilled consecutively. Drilling discharges resulting in smothering of benthic communities is considered to be relatively localised to within 1 km of the wells (Bakke et al. 2013; Ellis et al. 2012; Purser 2015). The minimum distance between the two OAs is >11 km; therefore, the discharge plumes are not expected to overlap and no cumulative impacts from smothering or increased turbidity are anticipated. The deep open ocean environment, combined with strong currents, will allow for rapid mixing and dilution of discharges from both MODUs, limiting the potential for impacts from concurrent operations. Localised changes to water quality will occur only in the immediate area around each discharge point and will return to normal conditions within minutes to hours of cessation.

Benthic communities are expected to continue to recolonise any disturbed areas upon completion of the activities and impacts to cultural receptors are not expected.

### 6.7.3 Environmental Performance Outcomes and Control Measures

The EPOs relating to drilling discharges are:

- No unplanned objects, emissions or discharges to sea or air [BB-EPO-06];
- Reduce impacts to air and water quality from planned discharges and emissions from the activities [BB-EPO-07]
- Seabed disturbance limited to planned activities and defined locations within the operational area [BB-EPO-02].

Control measures considered for drilling discharges are shown in Table 6-19, with associated EPS and measurement criteria shown in Table 8-2.

**Table 6-19: Control measures evaluation for planned drilling discharges**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-37 | Chemical selection procedure | Administrative | Aids in the process of chemical management that reduces the impact of drilling discharges to sea. Only environmentally acceptable | Cost associated with implementation of procedure.<br>Range of chemicals reduced with potentially higher costs for | **Adopted**<br>Environmental benefit of using lower toxicity chemicals outweigh procedural implementation costs. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | products are used. | alternative products. | |
| BB-CM-40 | Cuttings management system | Engineering | Reduces the concentration of drilling mud on cuttings prior to discharge while drilling with a closed circulating system, thereby reducing the total volume of mud lost to sea. | High cost associated with implementing procedure. | **Adopted**<br>Benefits of implementing procedure and measures implemented outweigh costs. |
| BB-CM-41 | Inventory control procedure | Administrative | Restricts the type and volume of drilling discharges and includes a decision-making framework for managing left-over bulk products (see Table 6-18). | Significant safety risks and/or costs associated with backloading bulk products to vessels for onshore disposal. | **Adopted**<br>High safety risks and costs associated with onshore disposal of the specified bulk products are grossly disproportionate to the low environmental impacts of disposal in deep, offshore waters. |
| BB-CM-42 | Decision list for managing bulk powders and brines remaining on the MODU at the end of the drilling campaign. | Administrative | Optimise resource recovery and reuse where possible as per Table 6-18.<br>Barite is an essential product for use in both drilling operations and as contingency for well control activities.<br>The Minamata convention requires best available techniques be adopted when considering discharge of wastes that contain any mercury content. Stock barite is known to contain low levels of naturally occurring mercury and barite stocks are tested to ensure they meet the limits prescribed by API standards (Mercury (Hg): max 1 mg/kg (<1 ppm) dry weight in stock barite). This limit supports the use | Administrative cost in identifying and assessing options.<br>The cost involved in transporting the remaining stock, as well as the additional GHG emissions and increased landfill associated with transport and disposal of this material outweighs the limited environmental benefit gained through avoiding overboard discharge (as a slurry). | **Adopted**<br>Environmental benefits of ensuring procedures are followed outweigh administrative costs |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | of barite as a necessary drilling operations material and the associated operational discharges.<br>Trace heavy metals in barite, including mercury, are present as primary inorganic, insoluble sulphide materials which have low bioavailability and environmental mobility (Neff, 2008). | | |
| BB-CM-32 | Well test procedures | Administrative | Ensures well testing fluids are appropriately managed and that oil-water content in formation water, if produced, is below 1% by volume. | Cost associated with implementation of procedure. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh costs |
| BB-CM-44 | Quality control limits for barite | Administrative | Contaminant concentration limits in barite meet API specifications to minimise the risk of seabed contamination. | Cost associated with implementation of procedure. | **Adopted**<br>Environmental benefits of ensuring procedures are followed outweigh costs. |
| BB-CM-45 | Only WBM will be used to drill the wells | Engineering | WBM is comprised of water or brine (greater than 90% aqueous) as the major liquid phase. The remainder of the WBM is made up of low toxicity drilling fluid solid additives (e.g. barite) and chemicals that are either completely inert or additives in such low concentrations they pose little or no risk to the environment.<br>WBM presents a lower toxicity mud system compared to other mud systems (e.g. synthetic base muds). | Cost associated with WBM use. | **Adopted**<br>Environmental benefit of using lower toxicity chemicals outweigh costs of other mud systems.<br>WBM systems have been used successfully on my wells in the region. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Additional Control Measures** | | | | | |
| N/A | Early establishment of closed circulating system | Engineering | Establishes a closed circulating mud system, hence provides an opportunity to re-use drilling fluids, thereby reducing environmental discharges. Does not reduce the volume of drilled cuttings discharged to sea. | Cost associated with change to well design. | **Not adopted**<br>A conductor reduces risk to well design by protecting the inner casings from the ocean. |
| N/A | Transportation of cuttings to shore for onshore treatment and disposal | Eliminate | Transfers the impact to the marine environment to the onshore environment. Onshore treatment of cuttings may introduce additional treatment measures | Cost associated with transportation and onshore management of cuttings.<br>Transfer of risk from marine environment to terrestrial environment. | **Not adopted**<br>The drill cuttings and fluids are inherently low risk due to the chemical selection process and the solids control equipment onboard the MODU. Transfer to shore for disposal results in little environmental benefit, while transferring the environmental risk to another location. The cost is grossly disproportionate to the environmental benefit. |
| N/A | Riserless mud recovery (RMR) | Engineering | RMR has the advantage of potentially reducing the volume of WBM discharged to the environment as well as preventing cuttings accumulation at the seabed.<br>RMR system returns top-hole cuttings/WBM from the riserless section of the well to the MODU and provides an opportunity to recover and re-use the WBM drilling fluids.<br>Recovery of the WBM drilling fluids reduces the fluids on the cuttings prior to disposal to | The planned configuration of the wells uses a 30″ conductor from the mudline back to the MODU. The next 17½″ interval is drilled 'riserless' i.e. without returns back to the mud pits and without a BOP in place. The total fluid (seawater/WBM) discharged for the 36″ conductor hole and 17½″ surface hole volume is 5,500 $m^3$ per well. The 17½″ surface hole interval, by virtue of the 30″ conductor, returns cuttings/seawater/WBM back up to the sea level | **Not adopted**<br>The critical path rig time would be affected by the requirement to install RMR equipment and would also require a bespoke package to be prepared for the wells.<br>There is negligible impact of discharging WBM and cuttings to sea due to the low environmental sensitivity of the seabed in the OAs.<br>Additionally, the reduction in seawater/WBM discharge is minimal and the cuttings discharge |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | the marine environment and subsequent impacts.<br>As discussed in Section 6.7.2, drilling fluids on cuttings increase the toxic effects to marine fauna and reduce the sediment quality over the area in which they are discharged.<br>However as discussed in Section 6.7.2, in general, the acute toxicity of WBM is low (Neff, 2005) and the impact from reduced sediment quality is anticipated to be detectable but insignificant to local population.<br>Disposal of cuttings using RMR from the MODU occurs below the water surface, instead of directly to seabed. Discharging from the MODU rather than at the seabed reduces the consequence of environmental impacts from smothering of surrounding benthic fauna and impact to sediment quality (see Section 6.7.2.2), due to a greater spread of cuttings on the seafloor. However, discharging the cuttings from the MODU results in a localised reduction in water quality from increased turbidity and water toxicity (see Section 6.7.2.1). | whilst drilling the interval (i.e. cuttings are discharged at sea level, not the seabed).<br>RMR is traditionally used on subsea wellhead systems to enable a closed mud system (weighted and/or inhibited) before the subsea BOP and marine riser is installed. In this case, WBM and cuttings go through the rigs solids control system and cuttings are discharged at sea level There are some examples of RMR being used on jack-ups where a closed system is required before the BOP is installed. Implementing RMR on a jack-up MODU on the wells would require a bespoke system to connect to the 30″ conductor at the tension deck level of the MODU and divert the returns back to the solids control system. For these planned jack-up wells, the net benefit would be potentially less WBM discharged to the environment (as a closed system can be used for a period, although the remaining WBM on board would be discharged at the end of the interval).<br>The volume of seawater/WBM discharged in the 36″ and 17½″ riserless intervals would be reduced if RMR were used. Cuttings | volume does not change compared to the base case if RMR is used. Therefore, the cost and effort is considered grossly disproportionate to the environmental benefit. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | discharge would be no different as cuttings would both be released at sea level. In the RMR case, cuttings going through the rig's solids control system would have less WBM entrained on them, but the residual mud recovered in this process would be discharged anyway.<br>The fabrication, rental and installation of a bespoke RMR package on the MODU is estimated to be ~1.5 MM<br>USD. This accounts for the time to rig up and rig down, rental and interfacing of the package. | |
| N/A | Further reduce the hydrocarbon content limit for well-cleanup fluids | Engineering | Has the potential to reduce the hydrocarbon content limit for well-cleanup fluids further. | Additional space required for additional treatment units and associated cost. | **Not adopted** – Given the minor impact from the discharge of well-cleanup fluids, which are discharged for a short period only, reducing the content further will have a negligible additional benefit to the marine environment. The higher safety risks and costs associated with additional water treatment (e.g. additional space required for additional treatment units) are considered grossly disproportionate to the negligible environmental benefit of further reducing oil in water content to <1% by volume. |

### 6.7.4 Environmental Impact Assessment

| Receptor | Consequence Level |
|---|---|
| **Drilling Discharges** | |
| Threatened, migratory or local fauna | No sensitive seabed features are known to occur within either OAs or in the area predicted to be contacted (directly or indirectly) by drilling discharges. The benthic habitats within the OAs and the area predicted to be contacted by drilling discharges are broadly homogenous and widely represented in the region (see Table 3-5).<br>Marine invertebrates may inhabit soft sediments and can contribute to the diet of some fauna. Non-coral benthic invertebrates may be present in the OAs and surrounds, including filter feeders such as sponges, soft corals, gorgonians, anemones and crinoids. However, there is not expected to be any significant areas of these. Furthermore, the area of soft sediment habitat that is potentially impacted is small compared to the amount of habitat available and therefore the disturbance is not expected to affect prey availability, or protected fauna species.<br>Recovery of benthic communities from burial and organic enrichment occurs by recruitment of new colonists from planktonic larvae and immigration from adjacent undisturbed sediments. Ecological recovery usually begins shortly after the end of drilling and often is well advanced within a year. Full recovery may be delayed until concentrations of biodegradable organic matter decrease through microbial biodegradation to the point where surface layers of sediment are oxygenated.<br>Habitat modification is identified as a potential threat to a number of marine fauna species in relevant recovery plans and conservation advice (Table 3-11). Impacts to threatened or migratory species will be temporary and the area potentially impacted is small compared to the size of the areas used by these species. Therefore, no long-term impacts to these species are expected. No decrease in local population size, area of occupancy of species, loss or disruption of critical habitat or disruption to the breeding cycle of any of these protected matters is expected.<br>OAs overlapping BIAs have been identified in Table 3-10. A whale shark foraging BIA overlaps the OAs (Figure 3-9). A pygmy blue whale migration BIA lies ~9 km beyond the Currie OA (Figure 3-10) and a humpback whale migration BIA is located ~13 km from the Mestrel/Bancroft OA. While the marine fauna may transit through the OAs, contact with drilling discharges are unlikely to result in impacts greater than a short-term behavioural change, limited to one or a few individual species. Mobile marine species are expected either to avoid turbid stretches of water or pass through with no significant impacts. The toxicity of WBM, formation water and cement is considered low and the potential for bioaccumulation of any toxic compounds is negligible. As with all chemicals selected for use in drilling operations by Santos, the chemicals chosen for the activity will be either CHARM rated Gold or Silver (or E or D OCNS) or risk assessed through the Chemical Risk Assessment process (Section 2.5) as being environmentally acceptable, reducing the likelihood of any impacts.<br>The increased particle load in the water column could adversely affect respiratory efficiency of fish, although most visual orientated fish species would likely avoid the affected area. The OAs and surrounds are in a high-energy, well mixed open water environment and significant discharge plumes are not expected to occur outside of the areas directly adjacent to the OAs.<br>Where two MODUs operate concurrently in separate OAs, the combined drilling discharges may occur at the same time rather than sequentially. However, the overall total volumes of cuttings and other drilling discharges will not increase, as the same number of wells would otherwise be drilled consecutively. Drilling discharges resulting in smothering of benthic communities is considered to be relatively localised to within 1 km of the wells (Bakke et al. 2013; Ellis et al. 2012; Purser 2015). The minimum distance between the two OAs is >11 km; therefore, the discharge plumes are not expected to overlap and no cumulative impacts from smothering or increased turbidity are anticipated. The deep open ocean environment, combined with strong currents, will allow for rapid mixing and dilution of discharges from both MODUs, limiting the potential for impacts from concurrent operations. Localised changes to water quality will occur only in the immediate area around each discharge point and will return to normal conditions within minutes to hours of cessation.<br>The consequence level is assessed as II – Minor, given the low toxicity of the drilling and cement discharges and there are no significant impacts expected to threatened and migratory fauna. |
| Physical environment or habitat | Local changes to soft sediment habitat will result from cuttings and associated drilling mud deposition near the MODU. Effects to benthic infauna communities from sedimentation and reduction in sediment quality resulting from drilling discharges have been determined to most likely be a result of smothering and a change in sediment texture as opposed to any toxicological effects, with increased clays and larger particles altering the habitat suitability for some species. |

| Receptor | Consequence Level |
|---|---|
| | Given the low toxicity of the materials to be discharged and the relatively small area predicted to be significantly smothered or have a reduction in sediment quality, overall impacts are considered to be minor to this habitat type and due to the loss of epifauna and infauna expected through smothering and release of drilling and cement discharges. The impacts are considered recoverable within months to years.<br>For cement discharges, geomorphology of the habitat would be altered, with cement hardening over time and blanketing the existing habitat. Although impacts on the form of the seabed and sediment quality in the immediate vicinity of the MODU will be longer term, the impacts are low in magnitude owing to the small area that would be affected.<br>If an exploration well is successful, it is possible that an appraisal well could be drilled near-by to the successful exploration well. Impacts to the seabed may occur within a previously disturbed area from cuttings (cuttings from drilling of an exploration well). Further discharge of cuttings over the already disturbed cuttings piles if an appraisal well was to be drilled in close proximity to an exploration well are not considered to pose significant impact other than smothering of benthic fauna already recolonising the area (impacts discussed above).<br>Where two MODUs operate concurrently in separate OAs, the combined drilling discharges may occur at the same time rather than sequentially. However, the overall total volumes of cuttings and other drilling discharges will not increase, as the same number of wells would otherwise be drilled consecutively. Drilling discharges resulting in smothering of benthic communities is considered to be relatively localised to within 1 km of the wells (Bakke et al. 2013; Ellis et al. 2012; Purser 2015). The minimum distance between the two OAs is >11 km; therefore, the discharge plumes are not expected to overlap and no cumulative impacts from smothering or increased turbidity are anticipated. The deep open ocean environment, combined with strong currents, will allow for rapid mixing and dilution of discharges from both MODUs, limiting the potential for impacts from concurrent operations. Localised changes to water quality will occur only in the immediate area around each discharge point and will return to normal conditions within minutes to hours of cessation. Impact is anticipated to be detectable but insignificant to local population.<br>The consequence level is assessed as II – Minor. |
| Threatened ecological communities | Not applicable – No threatened ecological communities are identified in the area where discharge effects could occur. |
| Protected areas | Not applicable – No protected areas within immediate vicinity of the OAs. |
| Socio-economic receptors | Impacts to commercial fishing are likely to be negligible, with important commercial species unlikely to be affected by drilling discharges due to the temporary nature of the discharges, rapid dilution of the plume and lack of significant seabed features in the area. Impacts to tourism and recreation are unlikely, given these activities occur in shallower water, closer to shore and distant from the potential area of impact from drilling discharges.<br>EP stakeholder consultation did not raise any concerns regarding potential drilling discharge impacts on cultural features, including sea country. Impacts to totemic species have been addressed under local fauna.<br>No stakeholder concerns have been raised regarding this event.<br>Overall, the consequence to socio-economic receptors from drilling and cement discharges is assessed as I – Negligible. |
| Overall worst-case consequence | II- Minor |

### 6.7.5 Demonstration of as Low as Reasonably Practicable

Drilling and cementing is a requirement of the activity, and the resultant fluid and solid by-products cannot be eliminated or avoided. To ensure environmental risks are reduced to ALARP, range of standard controls (Table 6-19) have been adopted. Santos uses a risk-based approach to selecting chemical products ranked under the OCNS as described in Section 2.5. *Santos' Drilling Fluid and Chemical Selection in Drilling Activities Procedure* requires that chemicals for use and discharge are CHARM rated Gold or Silver, or non-CHARM rated E or D. Any chemicals which are not OCNS CHARM or non-CHARM-able rated are risk assessed through the procedure to provide for a product that is environmentally acceptable for discharge to the marine environment. Only WBM will be used for drilling, due to its lower toxicity compared to other systems. A cuttings management system will be used to minimise residual mud on cuttings, reducing the total volume of discharge to the marine environment.

An inventory control procedure and decision framework for managing bulk powders and brines remaining on the MODU at the end of the drilling campaign restricts the type and volume of drilling discharges and supports decision-making for managing excess bulk product. There will be no discharge of bulk barite at the end of the drilling campaign.

A well test may be required on some wells to ascertain the pressure, flow characteristics and composition of the reservoir fluids. If undertaken, the well test equipment—including the fluid treatment system used to remove oil—is

separate from the MODU's MARPOL-compliant oily water treatment system, and will ensure formation water, if produced, is treated to <1% oil-in-water by volume prior to discharge.

Several additional control measures (Table 6-19) were evaluated but not adopted since it is disproportionate to the environmental benefit. Early establishment of a closed circulating system was not adopted due to incompatibility with well design and safety concerns, including conductor protection. Santos' are committed to returning excess bulk products to shore. In the first instance left-over bulk products is managed as per Table 6-18. If that cannot be achieved the products will be returned to shore providing always that safety risks in handling the bulks are managed to ALARP and are tolerable. The use of Riserless MUD Recovery (RMR) was not adopted due to the requirement for a bespoke system for jack-up MODUs, high cost (~1.5 million) and only marginal reduction in discharge volumes. Since cuttings would still be discharged at sea level and seabed sensitivity is low, the environmental benefit is minimal and not proportionate with cost and operational delays. Further reducing hydrocarbon content in well-cleanup fluids was also considered but not adopted due to short duration of such discharges and the already minimal impact. The space and cost associated with installing additional treatment units would introduce safety risks and were deemed grossly dipropionate to any minor additional benefit.

All reasonably practicable control measures have been reviewed (Section 6.7.3) and those adopted (Table 6-19) are considered appropriate to manage the impacts such that the residual consequence is assessed to be II – Minor. The proposed control measures are in accordance with the Santos risk management criteria and are considered appropriate to manage impacts to ALARP.

### 6.7.6 Acceptability Evaluation

| | |
|---|---|
| **Is the consequence ranked as I (Negligible) or II (Minor)** | Yes – maximum consequence from planned drilling discharges is II – Minor. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ESD. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – no contact with sensitive habitats or protected areas predicted. Control measures implemented will reduce the potential impacts from drilling discharges to species identified the relevant species recovery plans, conservation advice, wildlife conservation plans and other management plans/guidelines set out in Table 3-11.<br>Habitat degradation or modification is identified in a number of conservation advice(s) and within the *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017), however the nature of drilling discharges and scale of impacts will not result in habitat degradation. Pollution is identified in a number of plans but pertains to more toxic discharges and therefore is not considered applicable here given the discharges are allowable in accordance with legislation or are of low toxicity.<br>For the identified plans, the objectives of those plans are achieved through the adoption of performance outcomes and the control measures outlined in Section 6.7.3. Santos considers that the level of impact from drilling discharges is not inconsistent with these plans. |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | No concerns were raised during consultation on the EP.<br>During the public comment period, potential discharge impacts were raised. Discharge impacts are addressed in Section 6.7.2. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

With control measures in place to minimise the environmental impact of drilling discharges, the consequence was assessed as II – Minor and ALARP. The managed discharges will not reduce the habitat values of the area potentially affected as described in relevant Recovery Plans, Approved Conservation Advice or be inconsistent with the strategies of these documents. Therefore, the minor impacts expected from proposed drilling discharges are considered to be environmentally acceptable.

# 6.8 Spill Response Operations

The spill response strategies that may be adopted in the event of a hydrocarbon spill have been identified in the *Bedout Multi-Well Exploration and Appraisal Drilling OPEP* (7720-650-EMP-0006) for worst credible loss of well control (LOWC) and marine diesel spills. Potential impacts arising from the implementation of the following spill response operations or actions were assessed.

Santos' environmental assessment identified potential sources of environmental impacts associated with contingency spill response operations for this activity. The results of the environmental assessment are summarised in Table 6-1. A comprehensive risk and impact assessment for each of the contingency spill response operations, and subsequent control measures proposed by Santos to reduce the risk and impacts to ALARP and acceptable levels, are detailed in the following sub-sections.

## 6.8.1 Description of Event

| | |
|---|---|
| **Event** | In the event of a hydrocarbon spill, response strategies will be implemented where possible to reduce environmental impacts to ALARP. The selection of strategies will be undertaken through the Net Environmental Benefit Analysis (NEBA) process, outlined in this EP Addendum and the OPEP. Spill response will be under the direction of the relevant Controlling Agency, as defined within the OPEP, which may be Santos and/or another agency. In all instances, Santos will undertake a 'first-strike' spill response and will act as the Controlling Agency until the designated Controlling Agency assumes control. The response strategies deemed appropriate for the worst-case oil spill scenarios identified for the activity are detailed in Section 6 of the OPEP and comprise:<br>• source control<br>• monitor and evaluate (operational monitoring)<br>• mechanical dispersion<br>• chemical dispersant (surface and subsea)<br>• offshore containment and recovery<br>• shoreline protection and deflection<br>• shoreline clean-up<br>• oiled wildlife response<br>• scientific monitoring<br>• waste Management.<br>While response strategies are intended to reduce the environmental consequences of a hydrocarbon spill, poorly planned and coordinated response activities can result in a lack of, or inadequate information being available, upon which poor decisions can be made, exacerbating or causing further environmental harm. An inadequate level of training and guidance during the implementation of spill response strategies can also result in environmental harm over and above that already caused by the spill.<br>The greatest potential for impacts additional to those described for routine operations is from chemical dispersant on subsea receptors, shoreline clean-up and oiled wildlife response operations, where coastal and shoreline habitat damage and fauna disturbance may occur. |
| **Extent** | Spill response could occur anywhere within the EMBA for the worst-case spill scenarios. Some strategies will be concentrated in the vicinity of sensitive receptors in coastal waters and along shorelines. |
| **Duration** | The spill response effort as a whole will exceed the duration of the worst-case spill, due to persistence of the oil in the environment and the requirement to remove this oil and/or monitor impacts and recovery to sensitive receptors. The OPEP provides further detail the duration of specific response strategies. |

## 6.8.2 Nature and Scale of Environmental Impacts and Risks for the Activities

| **Spill Response** | |
|---|---|
| **Lighting** | |
| Spill response activities will involve the use of vessels, which are required, at a minimum, to display navigational lighting. Vessels may operate in close proximity to shoreline areas during spill response activities.<br>Spill response activities will also involve onshore operations, including the use of vehicles and temporary camps, which may require lighting. | |
| Potential Receptors: | • Fauna (including threatened, migratory or local fauna)<br>• Protected areas |
| Lighting may cause behavioural changes to fish, mammals, birds, and marine turtles that can have a heightened consequence during key lifecycle activities, such as turtle nesting and hatching. Turtles and birds, which includes threatened and migratory fauna (Table 3-9), have been identified as key fauna susceptible to lighting impacts. Section 6.3 provides further detail on the nature of impacts to fish, birds, and marine turtles. | |

**Spill Response**

Spill response activities that require lighting may take place in protected areas important to turtle and birds, such as shoreline locations of Bedout Island, Clerke Reef MP and Imperieuse MP. This could result in indirect impacts on the values of the protected areas.

During nesting and hatching season (primarily over summer months), lighting may cause behavioural impacts to turtles, including aborted nesting attempts and disorientation of newly hatched turtles, which may increase the hatchling mortality rate.

Spill response activities may also occur on shorelines used by nesting and feeding birds, including seabirds and shorebirds. Lighting can cause disorientation in flying birds, disrupt nesting and breeding behaviours and impact on the ability of birds to forage. Disturbance to feeding migratory shorebirds may reduce their ability to replenish energy reserves and alter the timing and success of migratory flights.

Lighting impacts to fauna are not considered to have the potential to impact supported industries such as tourism.

**Noise Emissions**

Spill response activities will involve the use of aircraft and vessels, which will generate noise both offshore and in proximity to sensitive receptors in coastal areas.

Spill response activities will also involve the use of equipment on coastal areas during clean-up of shorelines (e.g. pumps, generators and vehicles), for accessing shoreline areas (e.g. vehicles) and for supporting temporary camps (e.g. diesel generators).

| | |
|---|---|
| Potential Receptors: | • Fauna (including threatened, migratory, or local fauna)<br>• Protected areas<br>• Socio-economic receptors |

Underwater noise from the use of vessels may impact marine fauna, such as fish (including commercial species), marine reptiles and marine mammals, in the worst instance causing physical injury to hearing organs but more likely causing short-term behavioural changes, e.g. temporary avoidance of the area, which may impact key lifecycle processes (e.g. spawning, breeding, calving). Underwater noise can also mask communication or echolocation used by cetaceans. Section 6.4 provides further detail on these impacts from vessels and helicopters.

Cetaceans have been identified as the key concern for vessel noise within the EMBA. There are numerous BIAs for cetaceans within EMBA as listed in Table 3-10.

Spill response activities using vessels have the potential to impact fauna in protected areas, which may impact on the conservation values of protected areas. There are numerous Australian and State marine parks within the EMBA as listed in Table 3-7.

Noise and vibration from terrestrial activities on shorelines has the potential to cause behavioural disturbance to coastal fauna, including protected seabirds and turtles. Shoreline activities involving the use of noise-generating equipment may take place in important nesting areas for turtles and roosting and feeding areas for shorebirds.

As a consequence of impacts to fauna (including shorebirds, marine mammals, fish, and sharks), noise has the potential to impact supported industries such as tourism and commercial fishing and recreational values of marine parks.

**Atmospheric Emissions**

The use of fuels to power vessel engines, generators and mobile equipment used during spill response activities will result in emissions of greenhouse gases, such as carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$), along with non-GHGs such as sulphur oxides ($SO_X$) and nitrogen oxides ($NO_x$). Emissions will result in a localised decrease in air quality.

| | |
|---|---|
| Potential Receptors: | • Fauna (including threatened, migratory, or local fauna)<br>• Physical environment or habitat (air quality)<br>• Socio-economic receptors |

Atmospheric emissions from spill response equipment will be localised, and the use of mobile equipment, vessels and vehicles is not considered to create emissions on a scale where noticeable impacts would be predicted. Emissions may occur in protected areas and/or areas where tourism is important; however, the scale of the impact relative to potential oil spill impacts is not considered great.

**Operational Discharges and Waste**

Operational discharges include those routine discharges from vessels used during spill response, which may include:

- deck drainage
- putrescible waste and sewage
- cooling water from operation of engines
- bilge water
- ballast water
- brine discharge.

In addition, there are specific spill response discharges and waste creation that may occur**, including:**

- cleaning of oily equipment, oiled wildlife response activities, vessels and vehicles
- flushing water for the cleaning of shoreline habitats

| Spill Response | |
|---|---|
| • sewage and putrescible and municipal waste at camp areas<br>• creation, storage, transport and disposal of oily waste and contaminated organics. | |
| Potential Receptors: | • fauna (including threatened, migratory, or local fauna)<br>• physical environment or habitat<br>• protected areas<br>• socio-economic receptors |
| Operational discharges from vessels may create a localised and temporary reduction in marine water quality. Effects include nutrient enrichment, toxicity, turbidity, and temperature and salinity increases, as detailed in Section 6.6. Vessel discharges may occur in shallower coastal waters during spill response activities than that described in Section 6.6. Discharge could potentially occur adjacent to marine habitats, such as corals, seagrass and macroalgae, and in protected areas (i.e. receptors anywhere within the EMBA), which support a more diverse faunal community; however, discharges are still expected to be localised and temporary.<br>Cleaning of oil-contaminated equipment, vehicles and vessels has the potential to spread oil from contaminated areas to areas not impacted by a spill, potentially spreading the impact area, and moving oil into a more sensitive environment.<br>Flushing of oil from shoreline habitats is a clean-up technique designed to remove oil from the receptor that has been oiled and remobilise it back into the marine environment. It results in further dispersion of the oil. The process of flushing has the potential to physically damage shoreline receptors such as mangroves and rocky shoreline communities, increase levels of erosion, and create an additional and potentially higher level of impact than if the habitat was left to bioremediate.<br>Sewage and putrescible and municipal waste will be generated from onshore activities at temporary camps, which may include toilet and washing facilities. These wastes have the potential to attract fauna, impact habitats, flora, and fauna, and reduce the aesthetic value of the environment, which may be within protected areas. Disturbance may also impact cultural values of an area. The creation, storage, transport and disposal of oily waste and contaminated organics has the potential to spread impacts of oil to areas, habitats, and fauna not previously contaminated. Sewage and putrescible and municipal waste generated onshore will be stored and disposed of at approved locations. | |
| **Chemical Dispersant Application** | |
| The application of chemical dispersants has the aim of enhancing oil dispersion and entrainment into the water column, thereby avoiding, or reducing the volume of oil that could reach the shoreline. By entraining oil into the water column, chemical dispersants can aid the natural processes of biodegradation but can also increase impacts to subsea receptors through an increase in concentration and exposure of entrained oil and dissolved oil components. | |
| Potential Receptors: | • fauna (including threatened, migratory, and local fauna)<br>• physical environment or habitat<br>• protected areas<br>• socio-economic receptors |
| The application of dispersants will increase the amount of oil that is entrained and dissolved in the water column, reducing exposure of coastal ecosystems to floating weathered oil, as well as reducing the risk of exposure of seabird and marine mammal populations to floating oil (Bock et al. 2018; French-McCay et al. 2018; NRC 2005). It changes the distribution of the oil by removing it from the sea surface and dispersing it into the water column. This can increase the risk of toxic effects on planktonic, pelagic, demersal, and benthic organisms. French-McCay et al. (2018) simulated a deep-water oil well blowout to evaluate the potential benefits of subsurface dispersant injection. The authors concluded that subsurface dispersant injection has the potential to reduce the exposure of humans and wildlife to toxic volatile organic compounds of oil, increase biodegradation rates of oil and, and reduce the amount of oil at the surface and along shorelines.<br>Bock et al. (2018) used a comparative ecological risk assessment to investigate the benefit of subsurface dispersant injection. Their study also supported the conclusion that subsurface dispersant injection had important ecological and economic benefits because it reduces the risk of oil contacting shorelines and marine surface fauna.<br>A negative effect of subsurface dispersant injection is that the surfactants increase the bioavailability of oil components in the water column and more oil may remain at depth, potentially increasing the toxicity risk to deep-water fauna (French-McCay et al. 2018).<br>The toxicity of dispersants and the toxicity of dispersed oil are dependent on a range of factors including oil type, dispersant composition and concentration, sensitivity of receptor species and their life history, making generalisations difficult.<br>For the most studied dispersant formulations the increased risk for most taxa appears to come from the increased solubility (hence bioavailability) of the toxic components of the oil, not the dispersant itself (Negri et al. 2018). Adams et al. (1999), Brakstad et al. (2018), Clark et al. (2001), Fingas (2011, 2002), Hansen et al. (2014), and Mitchell & Holdway (2000) found current dispersants to be significantly less toxic than the oil alone or the dispersed oil. Gardiner et al. (2013) suggest that the chemical dispersant does not alter the toxicity of the oil or the underlying mechanism of toxicity in the spiked exposures, but rather enhances the absolute concentration of the dissolved hydrocarbons that contribute to toxicity. Adams et al. (2014) found chemically enhanced water-accommodated fractions (CEWAFs) to be more toxic to Atlantic herring than the water accommodated fractions (WAF); possibly reflecting the more effective dispersion due to chemicals. Contrary to this, Bejarano et al. (2014) reviewed dispersant toxicity studies and found that for Corexit 9500, the CEWAF was less toxic than the WAF. The NRC (2005) drew similar conclusions to Bejarano et al. (2014), reporting that evidence suggests that CEWAF is similar or less toxic than the WAF, depending on the basis of the study (measured TPH or nominal oil concentrations) (King & Dethier 2017). | |

| Spill Response |
|---|
| Despite the considerable amount of research, modelling and experimental work done to study the effects of subsea dispersant application, there is conflicting evidence as to the efficacy of the use of subsea dispersants (Quigg et al., 2021). However, NASEM (2020) found no compelling evidence that at low to moderate oil concentrations that chemically dispersed oil was any more toxic than oil alone. However, at high concentrations the combination of oil and dispersant appeared more toxic (Quigg et al., 2021).<br>Following application of chemical dispersants sub-sea or at the sea surface, the chemicals themselves are rapidly dispersed and diluted by oceanic water currents and buoyancy mixing.<br>Therefore, while the aim of chemical dispersants is to provide a net benefit to the environment, the use of dispersants has the potential increase the impact to receptors under the sea surface, including coral, seagrass and macroalgae, by increasing entrained oil and dissolved aromatic hydrocarbon concentration. These sensitive receptors are generally located in shallow coastal areas of the mainland and offshore islands.<br>Increased entrained and aromatic hydrocarbon concentrations may also impact on marine fauna either directly or through impacts to subsea habitats. Direct impacts are most likely to be encountered by filter feeding invertebrates, fish, and sharks. Fish and sharks include threatened/migratory species, which may ingest oil or uptake toxic compounds across gill structures. As a result of increased impact to marine fauna and subtidal habitats, including those that represent values of protected areas, socio-economic impacts may be felt through industries such as tourism and commercial fishing.<br>Chemical dispersants listed as approved in the *National Plan for Maritime Environmental Emergencies Register of Oil Spill Control Agents* (OSCA) are to be prioritised for use. The *Australian Maritime Safety Authority Efficacy Test Protocol for the Register* (Australian Maritime Safety Authority 2012) lists the toxicity testing requirements that ensure products meet the requirements of acceptable practice for the National Plan, and products with a high acute toxicity (LC50 <10 ppm, 96 hours) (NRC 1989) or containing prohibited substances are not permitted. If dispersant types additional to those on the Register of OSCA are required, Santos will use its *Offshore Division Operations Chemical Selection, Evaluation and Approval Procedure* prior to application. As such, impacts to the environment from the use of dispersants are acceptable and on application at the recommended dosage, dilution and dispersion will significantly reduce the concentrations to levels considered unlikely to have significant effects on protected species or marine biota and habitats.<br>A detailed description of the impacts from entrained and dissolved oil, which may be exacerbated by the application of chemical dispersants, is provided in Table 7-18. |
| **Physical presence and disturbance** |
| The movement and operation of vessels, vehicles, personnel and equipment, the undertaking of clean-up activities, and the set-up of temporary camp areas during spill response activities have the potential to disturb the physical environment and marine and coastal habitats and fauna, which may occur within protected areas. Disturbance may also impact cultural values of an area. Vessel movement and transportation could potentially introduce to nearshore areas invasive marine species attached as biofouling, while vehicle and equipment movement could spread non-indigenous flora and fauna.<br>Oiled wildlife response activities may involve deliberate disturbance (hazing), capture, handling, cleaning, rehabilitation, transportation, and release of wildlife, which could lead to additional impacts to wildlife. |

| | |
|---|---|
| Potential Receptors: | • fauna (including threatened, migratory, and local fauna)<br>• physical environment or habitat<br>• protected areas<br>• socio-economic receptors |

The use of vessels may disturb benthic habitats in coastal waters, including corals, seagrass, macroalgae and mangroves. Impacts to habitats from vessels include damage through the deployment of anchors, chains, and nearshore booms and from grounding. Vessel uses in shallow coastal waters also increases the chance of contact with or physical disturbance of marine megafauna such as turtles and dugongs. Booms create a physical barrier on the surface waters that has the potential to injure or entangle passing marine fauna that are either surface breathing or feeding.

Vehicles, equipment, personnel, and cleaning activities during shoreline response activities have the potential to damage coastal habitats, such as dune vegetation, mangroves, and habitats important to threatened and migratory fauna, including nests of turtles and birds and bird roosting and feeding areas. Shoreline clean-up may involve the physical removal of substrates that could cause impact to habitats and coastal hydrodynamics and alter erosion or accretion rates.

The presence of camp areas, although relatively short term, may disrupt normal behaviour of coastal species, such as shorebirds and turtles, and could potentially interfere with nesting and feeding behaviours.

Oiled wildlife response may include the hazing, capture, handling, cleaning, rehabilitation, transportation, cleaning, and release of wildlife susceptible to oiling, such as birds and marine turtles. While oiled wildlife response is aimed at having a net benefit, poor responses can potentially create additional stress and exacerbate impacts from oiling, interfere with lifecycle processes, hamper recovery and, in the worst instance, increase levels of mortality.

Impacts and risks from invasive marine species are described in Section 7.2 and are not described further in this section. Impacts from invasive terrestrial species are similar in that the invasive species (e.g. weeds) can outcompete local species and interfere with ecosystem processes. Non-native species may be transported attached to equipment, vehicles, and clothing. Such an introduction would be especially detrimental to wilderness areas or protected terrestrial reserves, which may have a relatively undisturbed flora and fauna community.

The disturbance to marine and coastal natural habitat, as well as the potential for disruption to culturally sensitive areas, may occur in specially protected areas and may have flow on impacts to socio-economic values and industry (e.g. tourism, fisheries).

| Spill Response | |
|---|---|
| **Disruption to Other Users of Marine and Coastal Areas and Townships** | |
| Spill response activities may involve the use of vessels, equipment and vehicles and the establishment of temporary camps in areas used by the general public or industry. The mobilisation of spill response personnel into an affected area may also place increased demands on local accommodation and other businesses. | |
| Potential Receptors: | • Socio-economic receptors |
| The use of vessels in the nearshore and offshore environment and the undertaking of spill response activities at shoreline locations may exclude the general public and industry use of the affected environment. As well as impacting leisure activities of the general public, this may impact on revenue with respect to industries such as tourism and commercial fishing. The mobilisation of personnel to small communities has the potential to affect the local community through demands on local accommodation and business, reducing the availability of services to members of the public. | |

### 6.8.3 Environmental Performance and Control Measures

The control measures considered for this activity are shown in Table 6-20. However, EPOs, EPS and measurement criteria for these spill response control measures are provided within the relevant strategy sections of the OPEP.

**Table 6-20: Control measures evaluation-Spill Response Operations**

| Control Measure | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|
| Competent Incident Management Team (IMT) and oil spill responder personnel | Ensures that spill response strategy selection and operational activities consider the potential for additional environmental impacts. | Personnel and operational costs associated with maintaining competent IMT team and responder personnel. | **Adopted** Considered a standard spill response control. |
| Use of competent vessel crew and personnel | Reduces potential for environmental impacts from vessel usage. | Personnel and operational costs associated with maintaining contracts with competent vessel crew and personnel. | **Adopted** Considered a standard spill response control. |
| Spill response activities selected on basis of a NEBA | Provides a systematic and repeatable process for evaluating strategies with net least environmental impact. | No cost/issue associated with this control measure. | **Adopted** Considered a standard spill response control. |
| **Noise and Atmospheric Emissions** | | | |
| Vessels and aircraft compliant with Santos' Protected Marine Fauna Interaction and Sighting Procedure | Reduces potential for behavioural disturbance to cetaceans. | No cost/issue associated with this control measure. | **Adopted** Ensures compliance with Part 8 of the EPBC Regulations 2000, which is considered a standard spill response control (regulatory requirement). |
| International Air Pollution Prevention Certificate | Reduces level of air quality impacts. | Personnel and operational costs associated with maintaining Air Pollution Certificate. | **Adopted** Considered a standard spill response control (regulatory requirement). |
| **Operational Discharges and Waste** | | | |
| Vessels meet applicable sewage disposal requirements | Reduces potential for water quality impacts. | No cost/issue associated with this control measure. | **Adopted** Considered a standard spill response control (regulatory requirement). |
| Vessel meets applicable requirements for oily water (bilge) discharges | Reduces potential for water quality impacts. | No cost/issue associated with this control measure. | **Adopted** Considered a standard spill response control (regulatory requirement). |

| Control Measure | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|
| Ballast Water Management Plan | Improve quality of water discharged to marine environment to ALARP.<br>Reduce risk of introduced marine species. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard spill response control (regulatory requirement). |
| Compliance with controlled waste, unauthorised discharge and landfill regulations | Ensures correct handling and disposal of oily wastes. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard spill response control (regulatory requirement). |
| **Chemical Dispersant Application** | | | |
| Chemical Dispersant Plan | Additional impacts from dispersant application are reduced to ALARP. | No cost/issue associated with this control measure. | **Adopted**<br>A standard control adopted by industry. |
| **Physical Presence and Disturbance** | | | |
| Vessels and aircraft compliant with Santos' Protected Marine Fauna Interaction and Sighting Procedure | Reduces potential for behavioural disturbance to cetaceans. | No cost/issue associated with this control measure. | **Adopted**<br>Ensures compliance with Part 8 of the EPBC Regulations 2000, which is considered a standard spill response control (regulatory requirement). |
| Use of shallow draft vessels for shoreline and nearshore operations | Reduce seabed and shoreline disturbance. | Operational costs associated with operating shallow draft vessels for shoreline and nearshore operations. | **Adopted**<br>Considered a standard control. |
| Oil Spill Response Team Leader assesses and selects vehicles appropriate to shoreline conditions | Reduce coastal habitat and fauna disturbance. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard control. |
| Conduct shoreline, nearshore habitat, bathymetry assessment | Reduce shoreline habitat disturbance. | Operational costs associated with conducting shoreline nearshore habitat assessment. | **Adopted**<br>Considered a standard control. |
| Establish demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting and roosting areas and turtle nesting habitat | Reduce coastal habitat and fauna disturbance. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard control. |
| Operational restriction of vehicle and personnel movement to limit erosion and compaction | Reduce coastal habitat erosion and compaction. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard control. |
| Prioritise use of existing roads and tracks | Reduce coastal habitat and fauna disturbance. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard control. |
| Select temporary base camps in consultation with DTMI and DBCA | Reduce coastal habitat and fauna disturbance. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard control to be adopted by the relevant Control Agency. |
| Soil profile assessment prior to earthworks | Reduce habitat disruption and erosion. | Operational costs associated with soil profile assessment. | **Adopted**<br>Considered a standard control. |
| Pre-cleaning and inspection of equipment (quarantine) | Prevent introduction of invasive species. | Operational costs associated with response plan. | **Adopted**<br>Considered a standard control. |

| Control Measure | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|
| Use of Heritage Advisor if spill response activities overlap with potential areas of cultural significance | Reduce disturbance to culturally significant sites. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard control to be adopted by the relevant Control Agency. |
| Adhere to WA Oiled Wildlife Response Plan and Pilbara Regional Oiled Wildlife Response Plan | Oiled wildlife hazing, capture, handling, and rehabilitation meet minimum standards as outlined within the WA Oiled Wildlife Response Plan. | Operational costs associated with response plan. | **Adopted**<br>Considered a standard control to be adopted by the relevant Control Agency. |
| **Disruption to Other Users of Marine and Coastal Areas and Townships** | | | |
| Stakeholder consultation | Promotes awareness and reduces potential impacts from response to socio-economic activities. | Minimal cost in relation to overall effort/costs in managing incident. | **Adopted**<br>Considered a standard control for incident management. |
| Utility resource assessment and support to be conducted if activity is of significant size in comparison to the size of the coastal community | Reduces potential impact due to higher utility demands causing disruptions to local community. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard control. |
| Accommodation assessment | Reduces strain on accommodation. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard control. |
| Transport Management Plan | Reduces potential for traffic disruptions. | No cost/issue associated with this control measure. | **Adopted**<br>Considered a standard control for large scale deployment in highly populated areas. |

### 6.8.4 Environmental Impact Assessment

| Receptor | Consequence Level |
|---|---|
| **Spill Response Operations- Light Emissions** | |
| Threatened, migratory or local fauna | The receptors considered most sensitive to lighting from vessel and shoreline operations are seabirds, shorebirds, and marine turtles, particularly over summer months with respect to marine turtles where emerging hatchlings are sensitive to light spill onto beaches. Following restrictions on night-time operations by spill response vessels, which will demobilise to mooring areas offshore with safety lighting only, impacts from vessels are considered to be Negligible (I).<br>Temporary camps will be positioned at the direction of DTMI or DBCA and control measures on lighting colour and direction will be followed, therefore, the consequence of shoreline lighting is considered Negligible (I).<br>These species are likely to be values of the protected area they occur in (e.g. Ningaloo Coast, Muiron Islands, Barrow Island, Montebello Islands, Dampier Archipelago, Clerke Reef, Imperieuse Reef), and the impact to the protected area from light is also considered Negligible (I).<br>As a consequence of impacts to fauna, lighting has the potential to impact supported industries, such as tourism; however, as impacts to fauna are considered negligible, any indirect impacts on tourism will also be Negligible (I). |
| Physical environment or habitat | |
| Threatened ecological communities | |
| Protected areas | |
| Socio-economic receptors | |
| Overall worst-case consequence level | I -Negligible |
| **Spill Response Operations- Noise Emissions** | |
| Threatened, migratory or local fauna | The receptors considered most sensitive to vessel noise disturbance is the pygmy blue whale and humpback whale during migration season, when these whales come close to the operational area during their peak migration (July to October), as well as populations of marine turtles, whale sharks and blue whales. However, following the adoption of control measures to limit close interaction with protected fauna (i.e. *Protected Marine Fauna Interaction and Sighting Procedure*), a temporary behavioural disturbance is expected only with a consequence of Negligible (I). |
| Physical environment or habitat | |
| Threatened ecological communities | |

| Receptor | Consequence Level |
|---|---|
| Protected areas<br>Socio-economic receptors | With respect to noise from onshore operations (mobile equipment and vehicles), nesting, roosting, or feeding birds are considered to be the most sensitive to noise, in particular shorebirds that may be aggregating at Ningaloo Coast, Muiron Islands, Montebello Islands, Bedout Island, Clerke Reef and Imperieuse Reef. The equipment used is not considered to have excessive sound levels and, following direction by DTMI and DBCA on the location of temporary camp areas, the consequence to birds from noise is expected to be Negligible (I). Shorebirds may be official values of the protected area they occur in, and the impact to the protected area from noise is also considered Negligible (I). |
| Overall worst-case consequence level | I – Negligible |
| **Spill Response Operations- Atmospheric Emissions** | |
| Threatened, migratory or local fauna<br>Physical environment or habitat<br>Threatened ecological communities<br>Protected areas<br>Socio-economic receptors | Atmospheric emissions from spill response equipment will be localised, and impacts to even the most sensitive fauna, such as birds, are expected to be Negligible (I). Because of the emissions will be localised and low level, impacts to protected area values, physical environment and socio-economic receptors are predicted to be Negligible (I). |
| Overall worst-case consequence level | I – Negligible |
| **Spill Response Operations- Operational Discharges and Waste** | |
| Threatened, migratory or local fauna<br>Physical environment or habitat<br>Threatened ecological communities<br>Protected areas<br>Socio-economic receptors | Operational discharges from vessels may create a localised and temporary reduction in marine water quality, which has the potential to impact shallow coastal habitats in particular. However, following the adoption of regulatory requirements for vessel discharges, which prevent discharges close to shorelines, discharges will have a negligible impact to habitats, fauna, or protected area values. Furthermore, washing of vessels and equipment will take place only in defined offshore hot zones preventing impacts to shallow coastal habitats.<br>As a consequence of impacts to fauna, operational discharges from vessels has the potential to impact supported industries, such as tourism and commercial fishing; however, as impacts to fauna are considered Negligible (I), any indirect impacts on socio-economic receptors will also be Negligible (I).<br>Onshore, the use of flushing water has the potential to damage sensitive shoreline and intertidal habitats, e.g. mangroves. However, low-pressure flushing only will be used, preventing further damage to habitats or erosion of sediments. For sensitive habitats, the deployment of booms will be considered to retain flushed hydrocarbons, if this presents a net benefit. Following these control measures, the use of flushing to clean shorelines and intertidal habitats is seen to have a Negligible (I) additional impact to habitats, fauna, or protected area values.<br>The cleaning of contaminated vehicles and equipment onshore has the potential to spread oily waste and damage habitats if not contained. Decontamination units will be in used during the spill response, thus containing waste, and preventing any secondary contamination. The consequence of cleaning discharges is therefore ranked as Negligible (I) in terms of impacts to habitats, fauna, or protected area values.<br>Sewage, putrescible waste, and municipal waste generated onshore will be stored and disposed of at approved locations. The storage, transport and disposal of hydrocarbon-contaminated waste arising from spill response operation actions, such as containment and recovery and shoreline clean up, will be managed by Santos' appointed waste management contractor, and dedicated waste containment areas will prevent the spreading or leaching of hydrocarbon contamination. The consequence of sewerage discharges is therefore ranked as Negligible (I) in terms of impacts to habitats, fauna, or protected area values. |
| Overall worst-case consequence level | 1 – Negligible |
| **Spill Response Operations- Chemical Dispersant Application** | |
| Threatened, migratory or local fauna<br>Physical environment or habitat | Use of chemical dispersants has the potential to increase the distribution and concentration of entrained oil and dissolved aromatic hydrocarbons within the water column. Entrained oil and dissolved aromatic hydrocarbons are expected to be elevated adjacent to the |

| Receptor | Consequence Level |
|---|---|
| Threatened ecological communities<br>Protected areas<br>Socio-economic receptors | dispersant release site with the potential for increased impacts to benthic and pelagic fishes, sharks, and invertebrates.<br>The effect of increased entrained oil and dissolved aromatic hydrocarbon concentration from surface dispersant application is likely to be most noticeable within ~100 km of the release site.<br>The generic impacts to receptors from entrained oil and dissolved aromatic hydrocarbons described in Table 7-18 are considered to apply. For impacts to the benthic habitat around the well location from surface dispersant application, the additional consequence is considered to be Minor (II), that is, there could be a detectable increase in impact from subsea chemical dispersant operations, but a significant additional increase is not expected. Similarly, the additional consequence to plankton, benthic invertebrates, fish, and sharks in the vicinity of dispersant operations is expected to be minor with a significant reduction in population size, attributable to dispersant use, not expected.<br>The primary controls for reducing impacts to these receptors from dispersant use is in the selection of approved or environmentally risk assessed chemical dispersants and through the careful assessment of application areas such that sensitive receptor impacts are reduced to ALARP. It is important to note that dispersants will only be applied if the response is seen as having a net environmental benefit as per the overarching NEBA analysis of spill response strategies. In the event dispersants are used there is the potential for a Minor (II) additional impact, noting that even in the absence of dispersant use, a greater volume of hydrocarbons may load onto shorelines adding to the level of impact on shoreline receptors.<br>The above assessment has considered only the potential negative effects of chemical dispersants on marine fauna and habitats from entrained oil and dissolved aromatic hydrocarbons. Chemical dispersant may lead to a reduction in the spatial extent of floating oil above 10 g/m$^2$, a reduction in the maximum concentration of floating oil arriving at shorelines, and a reduction in the volume of oil stranded on shorelines. These widespread positive effects to shoreline habitats and marine and coastal fauna are considered to outweigh the potential localised negative impacts outlined above. Thus, from an overall environment perspective, the surface dispersant strategy is predicted to have a net benefit based on the available evidence, noting that this would be confirmed or otherwise prior to and during any dispersant operations by a NEBA using situational data. |
| Overall worst-case consequence level | II – Minor |
| **Spill Response Operations- Physical Presence and Disturbance** | |
| Threatened, migratory or local fauna<br>Physical environment or habitat<br>Threatened ecological communities<br>Protected areas<br>Socio-economic receptors | The use of vessels and nearshore booms has the potential to disturb benthic habitats, including sensitive habitats in coastal waters, such as corals, seagrass, macroalgae and mangroves. A review of shoreline and shallow water habitats and of bathymetry and the establishment of demarcated areas for access and anchoring will reduce the level of impact to Negligible (I).<br>The use and movement of vehicles, equipment and personnel during shoreline response activities has the potential to disturb coastal habitats, such as dune vegetation, samphire and mangroves, and important habitats of threatened and migratory fauna, including nests of turtles and birds and bird roosting areas. Furthermore, clean-up can involve physical removal of substrates that could impact habitats and fauna and alter coastal hydrodynamics. As with vessel use, an assessment of appropriate vehicles and equipment to reduce habitat damage, along with the establishment of access routes, demarcation zones, and operational restrictions on equipment and vehicle use, will limit sensitive habitat damage and damage to important fauna areas. The establishment of temporary camp areas will be done under direction of DTMI and DBCA with suitable advice sought if access to culturally significant areas is needed. Following these and other control measures, the resultant consequence to the physical environment and habitat is assessed as Minor (II), indicating that there may be a detectable reduction in habitat area from response activities (as separate from spill impacts), but recovery will be relatively rapid once spill response activities cease. As with all spill response activities, this disturbance will only occur if there is a net benefit to accessing and cleaning shoreline areas. |
| Overall worst-case consequence level | II – Minor |
| **Spill Response Operations- Disruption to Other Users of Marine and Coastal Areas and Townships** | |
| Socio-economic receptors | The use of vessels in the nearshore and offshore environment and spill response activities at shoreline locations and within townships may exclude general public and industry use. Note that this is distinct from the socio-economic impact of a spill itself, which would have a far greater detrimental impact to industry and recreation. Following the application of control measures, it is considered that the additional impact of spill response activities on affected industries would be Minor (II). |

| Receptor | Consequence Level |
|---|---|
| Overall worst-case consequence level | II – Minor |

### 6.8.5 Demonstration of as Low as Reasonably Practicable

With the controls in place, as detailed in Section 6.8.3, potential impacts to from spill response operations are ALARP as demonstrated below:

A NEBA is the primary tool used during spill response to evaluate response strategies and has the goal of selecting strategies that result in the least net impact to key environmental sensitivities. The NEBA process will identify and compare net environmental benefits of alternative spill response options. The NEBA will effectively determine whether an environmental benefit will be achieved through implementing a response strategy or by undertaking no response. The NEBA will be undertaken by the relevant Controlling Agency for the activity. For those activities under the control of Santos, the IMT Environmental Team Leader will be responsible for reviewing the priority receptors and selected response strategies identified in this EP and coordinating the NEBA for each operational period. This will demonstrate that, at the strategy level, the response operations reduce additional environmental impacts to ALARP.

Spill response activities will be conducted in offshore and coastal waters using vessels and aircraft. The greatest potential for additional impacts from implementing spill response is considered to be on wildlife in offshore waters from oiled wildlife response activities and to shoreline habitats and fauna receptors within shallow waters or on shorelines from nearshore booming and shoreline clean-up activities.

Given the types of activities considered appropriate for responding to a worse-case spill and the scale of operations, standard control measures adopted by Santos for spill response to reduce the level of additional impacts are considered to reduce these impacts to ALARP. This includes working with the relevant Controlling Agency for spill response and applying the appropriate processes and standards, e.g. for oiled wildlife response as included within the WA Oiled Wildlife Response Plan and Pilbara Regional Oiled Wildlife Response Plan.

Santos considers the actions prescribed in the *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017) and approved conservation advice for other threatened fauna (Table 3-11) relevant to spill responses for the activities to minimise noise and light impacts on cetaceans, sharks, marine turtles, seabirds and shorebirds. The proposed event will not result in significant impacts on these species, and implementation of identified control measures is in line with the relevant conservation advice(s) and recovery plans. Pollution events (such as hydrocarbon spills) could impact on fauna (as described in Section 7.5), and the use of vessels and equipment during the spill response could result in potential impacts as described in this EP. Control measures in place for vessel and helicopter use will reduce potential impacts to marine fauna, and these are consistent with current conservation advice. The assessed residual consequence for this impact is minor and cannot be reduced further without disproportionate costs. It is considered therefore that the impact of the activities conducted are acceptable and ALARP.

### 6.8.6 Acceptability Evaluation

| | |
|---|---|
| **Is the consequence ranked as I or II?** | Yes – maximum consequence is II (Minor) from planned events. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with *Santos' Environmental Hazard Identification and Assessment Procedure*, which considers principles of ecologically sustainable development.<br>The consequence against this aspect is II (Minor) and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5 |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – IUCN principles and strategic objectives of nearby reserves (e.g. Rowley Shoals MP, Eighty Mile Beach MP and AMP, and the North-west MPNMP) are met.<br>Controls implemented will minimise the potential impacts from the activity to species identified in recovery plans and conservation advice as having the potential to be impacted by spill response operations. Relevant species recovery plans, conservation management plans and management actions are detailed in Table 3-11.<br>Management is also consistent with the zoning of the Australian marine parks, in that risks have been reduced to ALARP, e.g. implementation of spill response activities will limit impacts, thereby conserving the marine park values.<br>Management consistent with EPBC Act Regulations (Part 8), Marine Orders (91, 96 and 97) and Australian Ballast Water Requirements. |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | During any spill response, a close working relationship with relevant regulatory bodies (e.g. DTMI, DBCA, AMSA) will occur. Santos will also notify First Nations people who have requested as such during consultation (Refer Table 8-4).<br>As such, there will be ongoing consultation with relevant stakeholders on the acceptability of response operations.<br>Wildlife response will be conducted in accordance with the *WA Oiled Wildlife Response Manual* (DBCA, 2022), *Oiled Wildlife Response Manual Plan* (DBCA, 2022b) and *Pilbara Regional Oiled Wildlife Response Plan* (DPAW, 2014).<br>During the public comment period, a comment was raised regarding spill response timeframes. These matters are addressed in Section 7.6.6. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

The implementation of spill response activities to reduce the potential impacts from a spill are required by legislation. The spill response options selected have been demonstrated to show a net environmental benefit, are standard industry practice and are consistent with relevant standards and guidelines, including the *National Plan for Maritime Environmental Emergencies* (AMSA, 2020). No concerns were raised during stakeholder consultation on the EP, however comments were received during the public consultation period. response timeframes. Santos has addressed these matters in the Titleholder response to public comments, and in Section 7.6.6. The controls used during spill response activities are therefore considered to reduce additional impacts to an acceptable level.

# 7. Environmental Risk Assessment for Unplanned Events

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 21. Environmental assessment.** |
| Evaluation of environmental impacts and risks<br>21(5) The environment plan must include:<br>a) details of the environmental impacts and risks for the activity; and<br>b) an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk; and<br>c) details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level.<br>21(6) To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all the environmental impacts and risks arising directly or indirectly from:<br>a) all operations of the activity; and<br>b) potential emergency conditions, whether resulting from accident or any other reason<br>21(7) The environment plan must:<br>a) set environmental performance standards for the control measures identified under paragraph (5)(c); and<br>b) set out the environmental performance outcomes for the activity against which the performance of the titleholder in protecting the environment is to be measured; and<br>c) include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met. |

An ENVID workshop for the unplanned events held on 17th September 2024 identified seven potential sources of environmental risks associated with unplanned events for this activity. A refresher workshop was held on 5th May 2025 to ensure that the information was still current. The results of the environmental assessment are summarised in Table 7-1. A comprehensive risk and impact assessment for each of the unplanned events and subsequent control measures proposed by Santos to reduce the risk and impacts to ALARP are detailed in the following subsections.

**Table 7-1: Summary of risk assessment ranking for unplanned activities**

| EP Section Reference | Event | Consequence | Likelihood | Residual Risk Level |
|---|---|---|---|---|
| 7.1 | Release of solid objects | I-Negligible | d-Occasional | Low |
| 7.2 | Introduction of invasive marine species | III-Moderate | a-Remote | Very low |
| 7.3 | Marine fauna interaction | II-Minor | c-Possible | Low |
| 7.4 | Non-hydrocarbon and chemical releases | I-Negligible | c-Possible | Very Low |
| 7.6 | Hydrocarbon spill-loss of well control | IV-Major | a-Remote | Low |
| 7.7 | Hydrocarbon spill-marine diesel oil | III-Moderate | b-Unlikely | Low |
| 7.8 | Minor hydrocarbon releases | II-Minor | c-Possible | Low |

# 7.1 Release of Solid Objects

## 7.1.1 Description of Event

| | |
|---|---|
| **Event** | Solid objects, such as those listed below, can be accidentally released to the marine environment, and potentially impact sensitive receptors:<br>• Non-hazardous solid wastes such as paper and packaging<br>• Hazardous solid waste such as batteries and fluorescent tubes<br>• Equipment and materials such as hard hats, tools or infrastructure parts.<br>Release of solid objects may occur as a result of:<br>• Overfull and/or uncovered bins<br>• Incorrectly disposed items<br>• Incidents during transfers of waste or supplies<br>• Dropped objects/lost equipment. |
| **Extent** | The event will only occur within the OAs, and all non-buoyant material or dropped objects are expected to remain within the OAs. Buoyant objects could potentially move beyond the OAs. |
| **Duration** | All dropped objects are planned to be recovered (where safe to do so) and therefore impacts are expected to be temporary. |

## 7.1.2 Nature and Scale of Environmental Impacts

**Potential Receptors**: Physical environment (benthic habitat and water quality), marine fauna (cetaceans, turtles, sharks, fish, rays, seabirds), cultural receptors (totemic species).

Release of hazardous solid waste such as batteries, fluorescent tubes, medical wastes and aerosol cans may result in the pollution of the immediate receiving environment, leading to detrimental health impacts to marine flora and fauna. Chemical effects such as physiological damage through ingestion or absorption may occur to individual fish, cetaceans, marine reptiles or seabirds.

### 7.1.2.1 Physical Environment

Objects may inadvertently fall to the seabed due to factors such as crane failure, adverse weather, human error, rigging failure, or vessel motion. These incidents can lead to equipment and items being lost at sea, potentially disrupting benthic habitats. The area of potential disturbance from non-buoyant dropped objects would be limited to the OA where the item falls. Upon reaching the seabed, these objects cause localised disturbance, restricted to their footprint. As the OAs primarily consists of soft sediments (Figure 3-3) with minimal epifauna, the benthic habitats will experience disturbance, but not significant degradation.

While soft sediment benthic habits will not be destroyed, disturbance of the communities on and within them (i.e. the epifauna) will occur in the event of a dropped object and depressions may remain on the seabed for some time after removal of the dropped object as they gradually infill over time.

Buoyant dropped objects have the potential to be transported by marine currents and may impact on reefs, islands, shoals and banks within the region. Accidentally dropped objects, such as plastics, have the potential to smother benthic environments, and the release of hazardous solids (e.g. wastes such as batteries) could also impact water quality through pollution of the immediate receiving environment. Impacts from accidentally released liquids are discussed in Section 7.4.

### 7.1.2.2 Threatened, Migratory or local fauna

Plastics and other solid objects pose serious risks to marine fauna through entanglement or ingestion. There are a range of marine fauna in the region, including cetaceans, marine reptiles, pelagic and demersal fishes, and seabirds (Section 3.2.6). In addition, a number of BIAs overlap the OAs (see Table 3-10).

Marine turtles are particularly at risk, as they may become entangled or mistake plastic for jellyfish while feeding. The *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017) identifies marine debris ingestion as a significant threat to all turtle species. Seabirds, which forage on surface plankton, may also ingest floating plastic, leading to internal damage or death.

Marine debris is recognised as a threat to marine turtles, humpback whales, and whale sharks in recovery plans and conservation advice. These recovery plans and approved conservation advice, as well as the *Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans* (Commonwealth of Australia, 2018a), have specified a number of recovery actions to help combat this threat. Of relevance to this activity is the legislation for the prevention of garbage disposal from vessels.

The release of hazardous solid objects like batteries can also pollute the environment, causing localised harm to marine flora and fauna. Ingestion or absorption of these materials may lead to physiological damage in fish, cetaceans, marine reptiles, and seabirds. The risk to marine mammals from solid material loss, through potential entanglement or microplastic ingestion, is assessed as minor and limited to a small number of individuals, unlikely to cause significant population-level impacts.

#### 7.1.2.3 Cultural receptors

Totemic species of cultural value may pass through the OAs; however, during consultation, Santos has not been made aware of any other cultural receptors within the OAs. Impacts to local fauna have been considered in Section 7.1.2.2.

### 7.1.3 Environmental Performance Outcomes and Control Measures

The EPOs relating to this event include:

- No unplanned objects, emissions or discharges to sea or air [BB-EPO-06]
- No injury or mortality to EPBC Act and BC Act listed marine fauna during activities [BB-EPO-05].

The control measures for this event are shown in Table 7-2 and the EPSs and measurement criteria for the EPOs are described in Table 8-2.

**Table 7-2: Control measure evaluation for the unplanned release of solid objects**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost / Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-46 | Dropped object prevention procedures | Administrative | Impacts to environment are reduced by preventing dropped objects and by retrieving dropped objects unless the environmental consequences are negligible or there are risks to safety.<br>Minimises drop risk during lifting operations.<br>Ensures lifting equipment is certified and inspected. | Personnel costs involved in implementing procedures and in incident reporting. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh cost to Santos. |
| BB-CM-34 | Waste (Garbage) management procedures | Administrative | Reduces probability of garbage being discharged to sea, reducing potential impacts to marine fauna.<br>Stipulates putrescible waste disposal conditions and limitations.<br>Marine Order 95 (Marine pollution prevention – garbage). | Personnel cost of premobilisation audits and inspections and in reporting discharge levels. | **Adopted**<br>Benefits of ensuring vessels are compliant outweighs the minimal costs of personnel time and it is a legislated requirement. |
| BB-CM-47 | Hazardous chemical management procedures | Administrative | Reduces the risk of spills and leaks (discharges) to the sea by controlling the storage, handling, and clean-up of hazardous chemicals. | Cost associated with permanent or temporary storage areas. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost / Issues | Evaluation |
|---|---|---|---|---|---|
| BB-CM-48 | International Maritime Dangerous Goods Code | Administrative | Reduces the risk of an environmental incident, such as an accidental release to sea or unintended chemical reaction. | Cost of implementing procedures. | **Adopted**<br>It is a Regulatory requirement |
| BB-CM-37 | Chemical selection procedure | Administrative | Aids in the process of chemical management that reduces the risk of accidental discharge to sea by controlling the storage, handling and clean-up of chemicals. | Cost associated with implementation of procedure. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time. |
| BB-CM-36 | General chemical management procedures | Administrative | Reduces the risk of spills and leaks (discharges) to sea by controlling the storage, handling and clean-up. | Personnel costs associated with ensuring procedures are in place and implemented. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time. |
| **Additional Control Measures** | | | | | |
| N/A | Eliminate lifting in field | Eliminate | Reduces the risk release of non-hydrocarbon solid to the marine environment due to dropped object. | Eliminating lifting would require vessels storing more equipment and supplies on-board, and/or additional trips to shore. Vessels will not have enough deck space to store all required equipment, materials, supplies needed for the duration of the activity. | **Not adopted**<br>Not feasible to eliminate lifting in the OAs. |

### 7.1.4 Environmental Impact Assessment

| Description | |
|---|---|
| **Receptors** | • physical environment (benthic habitat and water quality)<br>• marine fauna (marine mammals, marine reptiles, sharks and rays, fish and birds) |
| **Consequence** | I-Negligible |

**Physical environment – benthic habitats**

The impact of non-buoyant dropped objects will be confined to the area directly affected by the object. Given the size of the materials being transferred, any disturbances are likely to be minor and limited to the OAs. Buoyant objects may potentially smother benthic habitats or wash up on shore, but effective management measures will address these risks.

As the benthic habitats in the OA are common across the region and do not include sensitive areas, the potential impact from lost solid material is considered negligible.

**Threatened, migratory or local fauna (marine mammals, marine reptiles, sharks and rays, fish and birds)**

The release of solid objects to the marine environment has the potential to cause minor impact to marine fauna. Ingestion of solid wastes by marine fauna could occur in small quantities. Only small volumes of non-hydrocarbon solids would be generated during the activity, as a result, any accidental loss to the environment would be small in size. Any impacts would be restricted to a small number of individuals, if any. Relevant recovery plans and conservation advice have identified marine debris as a potential threat. There is a *Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans* (Commonwealth of Australia, 2018a). As such there is the potential for impacts only to a small proportion of a local population with no consequences for conservation status or reproductive success of cetaceans, marine

| Description | |
|---|---|
| turtles or fish species that may occur in the area. The limited quantities associated with this unplanned event indicate that even in a worst-case release of solid waste, the impacts would be limited to individuals and is not expected to result in a decrease of the local population size. Therefore, the consequence is assessed as I – Negligible. | |
| **Likelihood** | Occasional |
| Control measures proposed will minimise the risks associated with dropped solids (including plastics), lost equipment, or the release of hazardous and non-hazardous solid waste into the environment. These measures will also ensure compliance with legislation on garbage disposal from vessels, as outlined in the *Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans* (Commonwealth of Australia, 2018a). The likelihood of solid objects being released during the activity is considered occasional, given that similar incidents have occurred in the industry before and could potentially happen in the coming months to years. | |
| **Residual Risk** | Low |

### 7.1.5 Demonstration of as Low as Reasonably Practicable

Solid waste will be generated throughout the activity from vessel and MODU operations, including during routine lifting and transfer activities. The primary environmental risk from these operations relates to accidental releases of non-hydrocarbon solids, such as dropped objects or bulk material losses.

Several standard control measures (Table 7-2) have been adopted to manage these risks and reduce potential environmental harm to ALARP. These include implementation of a dropped object prevention procedure, which ensures lifting equipment is certified, maintained, and inspected, and that appropriate lifting techniques are followed to minimise drop risks. It also requires that dropped objects are retrieved unless environmental consequences are negligible or recovery poses a safety hazard.

Waste (garbage) management procedures, aligned with Marine Order 95, are in place to prevent accidental discharge of general solid waste, with controls on disposal conditions and limitations for putrescible waste. Additional procedures for hazardous chemical management, general chemical handling, and chemical selection are applied to control the storage, transfer, and disposal of materials, thereby reducing the risk of accidental solid releases. The use of the International Maritime Dangerous Goods (IMDG) Code ensures the safe handling and segregation of dangerous goods. These measures, collectively, ensure that the risk of non-hydrocarbon solid waste entering the marine environment remains low and within acceptable limits.

Additional control measures (Table 7-2) were considered but not adopted since the cost, operational feasibility, or associated safety risks were disproportionate to the limited environmental benefit. Eliminating lifting operations within the field was assessed but not adopted. Removing the need for offshore lifting would require all equipment, materials, and supplies to be stored on vessels for the full duration of the activity. This is not feasible due to limited deck space and would result in increased trips to and from port, leading to greater fuel consumption, atmospheric emissions, and operational risk. Given these constraints, the measure was deemed not reasonably practicable.

With the adopted controls in place and no further feasible controls identified, the residual risk of non-hydrocarbon solid releases is assessed as Low, and the impact is considered reduced to ALARP.

### 7.1.6 Acceptability Evaluation

| | |
|---|---|
| **Is the risk ranked between Very Low to Medium?** | Yes – residual risk is ranked Low. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ESD. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – management consistent with Marine Order 95. Controls implemented will minimise the potential impacts from the activity to species identified in recovery plans and approved conservation advice as having the potential to be impacted by solid objects.<br>Specific actions that contribute to the long-term prevention of marine debris (Objective 1 of the *Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans* [Commonwealth of Australia, 2018a]) have been adopted, including compliance with applicable legislation in relation to the improvement of waste management practices. |

| | |
|---|---|
| | Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-11. |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | There were no concerns raised during consultation on the EP. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

The handling and use of non-hydrocarbon solid materials is standard industry practice and the potential impacts well understood. This aspect will be managed consistent with relevant legislation, regulations and guidelines and the residual risks are low and ALARP. The proposed control measures align with the actions outlined in relevant fauna recovery plans, conservation advice, and management plans. No concerns have been raised by relevant stakeholders regarding this issue. With these control measures in place to prevent such releases, the impacts are deemed to be ALARP and environmentally acceptable.

## 7.2 Introduction of Invasive Marine Species

### 7.2.1 Description of Event

| | |
|---|---|
| **Event** | Introduction of invasive species (IMS) may occur due to:<br>• biofouling on MODU or support vessels including external/internal niches (e.g. sea chests, sea water systems)<br>• biofouling on equipment that is routinely submerged in water (e.g. ROVs)<br>• discharge of ballast water<br>• cross contamination between vessels and the MODU. |
| **Extent** | Localised (seabed within the OAs) to widespread impact if successfully translocated to new areas via ocean currents or project equipment transit. |
| **Duration** | Temporary to long-term (in the event of successful translocation and establishment). |

### 7.2.2 Nature and Scale of Environmental Impacts

**Potential receptors**: Physical environment (benthic habitats), threatened/migratory fauna (marine mammals, marine reptiles, sharks, fish and rays) and socio-economic receptors (fisheries, tourism and recreation), cultural receptors (totemic species).

Invasive marine species (IMS) are marine plants, animals and algae that have been introduced into a region that is beyond their natural range but that have the ability to survive and possibly thrive. The majority of climatically compatible IMS to the North West Shelf are found in south-east Asian countries. Some IMS pose a significant risk to environmental values, biodiversity, ecosystem health, human health, fisheries, aquaculture, shipping, ports and tourism (Wells *et al*., 2009). IMS can cause a variety of adverse effects in a receiving environment, including:

- over predation of native flora and fauna
- displacement of native marine species
- outcompeting of native flora and fauna for food
- depletion of viable fishing areas and aquaculture stock
- reduction of coastal aesthetics.

The above impacts can result in flow-on detrimental effects to fisheries, tourism and recreation. IMS of concern are those that are not native to the region, are likely to survive and establish in the region, and are able to spread by human mediated or natural means. Species of concern vary from one region to another depending on various environmental factors, such as water temperature, salinity, nutrient levels and habitat type. These factors dictate their survival and invasive capabilities.

It is recognised that artificial, disturbed and/or polluted habitats in tropical regions are susceptible to invasive marine species introductions, which is why ports are often areas of higher IMS risk (Bax et al., 2003) Neil et al., 2005). However, in Australia there are limited records of detrimental impact from IMS compared to other tropical regions (such as the Caribbean). Following their establishment, eradication of IMS populations is difficult, limiting management options to ongoing control or impact minimisation. Case studies in Australia indicate that, from detection to eradication, this can take approximately four weeks (Bax et al., 2003). However, this depends on the environmental conditions and species. For this reason, increased management requirements have been implemented in recent years by Commonwealth and State regulatory agencies. Ballast water is responsible for 20–30% of all marine pest incursions into Australian waters. However, research indicates that biofouling (the accumulation of aquatic micro-organisms, algae, plants and animals on vessel hulls and submerged surfaces) has been responsible for more foreign marine introductions than ballast water (Bax et al., 2003; DAFF, 2011). The potential biofouling risk presented by vessels will relate to:

- the length of time that these vessels have already been operating in Australian waters or, if they have been operating outside Australian waters
- the locations of the operations they have been undertaking
- the length of time spent at these locations
- whether the vessels have undergone hull inspections, cleaning, and application of new anti-foulant coating prior to returning to operate in Australia.

The risk of introducing IMS is limited by the OA's position in relatively deep (~80–265 m), offshore waters, away from shoals or banks. IMS typically face challenges in establishing themselves in deep water ecosystems because these environments lack the light and suitable habitats required for their growth and survival (Geiling, 2014). IMS

are usually found in tidal and subtidal zones, with only a few species extending into deeper continental shelf waters (Bax et al., 2003). Furthermore, highly disturbed environments, such as marinas and jetties, are more prone to IMS colonisation compared to open-water settings, where high rates of dilution and dispersal make establishment less likely (Paulay et al., 2002).

### 7.2.3 Environmental Performance Outcomes and Control Measures

The EPO relating to this event includes:

- No introduction of marine pest species [BB-EPO-09]

The control measures for this event are shown in Table 7-3 and the EPSs and the measurement criteria for the EPOs are described in Table 8-2

**Table 7-3: Control measure evaluation for unplanned introduction of invasive marine species**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-49 | Implementation of the management controls in the *Santos Invasive Marine Species Management Plan* (IMSMP) | Administrative | The risk of introducing IMS is reduced due to assessment procedure and management of ballast water. | Personnel costs involved in risk assessing vessels in accordance with the Santos Invasive Marine Species Management Plan.<br>Costs associated with reducing the vessel risk to 'low' (e.g. dry docking, hull cleaning or additional costs due to inspections). Could lead to potential delays and therefore costs in vessel contracting process due to unavailability of vessels. | **Adopted**<br>It is a legislated requirement. |
| BB-CM-50 | Anti-foulant system | Engineering | The likelihood of introducing IMS is reduced due to antifoulant systems being compliant with legislation. | Cost associated with contracting assurance checks of anti-fouling systems.<br>Regulatory requirement. | **Adopted**<br>It is a legislated requirement. |
| BB-CM-11 | Marine assurance standard | Administrative | Ensures contracted vessels are operated, maintained and manned in accordance with industry standards and regulatory requirements (this EP) and the relevant Santos procedures mentioned in this EP. | No additional cost. | **Adopted**<br>Benefits considered to outweigh negligible costs to Santos. |
| **Additional Control Measures** | | | | | |
| N/A | Heat or chemical treatment of ballast water to eliminate IMS. | Engineering | Would reduce potential for IMS to establish by eliminating individuals present in ballast water. | High cost compared to existing risk; introduction of chemicals or water at much higher temperature than surrounding marine environment would likely be toxic or | **Not Adopted**<br>Based on increased risk to marine environment and high cost considered disproportionate compared to base |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | result in death of native marine species. | case risk (after application of standard controls) (see above). |
| N/A | Contract MODU and vessels only operating in local, State or Commonwealth waters to reduce potential for IMS. | Substitute | Reduce potential for IMS to be transported into area since vessels would not have originated elsewhere. | MODU, vessels and equipment suitable for the activity may not be available in State/Commonwealth waters. Potential significant costs and delay in activity schedule by only contracting MODU/ vessels working in State/ National waters. | **Not Adopted** Not feasible. |
| N/A | Mandatory dry docking of vessels prior to entering field to clean vessel and/or equipment and remove biofouling. | Protective | Ensure that no IMS are present on vessel or associated equipment. | Significant cost (grossly disproportionate to the risk) would lead to scheduling delays. | **Not Adopted** Costs disproportionately high compared to environmental benefit given other controls in place already reduce the risk. |
| N/A | Utilise an alternative ballast system to avoid uptake and discharge of water in MODU and vessels. | Substitute | Eliminate need for ballast water exchange, therefore decreasing risk of introducing IMS through ballast water. | MODU and vessels suitable for the activity may not have options for alternative ballast, therefore would require modification at significant cost. | **Not Adopted** Cost disproportionately high compared to environment benefit. |
| N/A | Zero discharge of ballast water. | Eliminate | Would reduce the potential for IMS by implementation of no ballast water exchange policy on MODU and vessels. | Ballast water exchange required on the MODU and vessels for stability. | **Not Adopted** On the basis that ballast water exchange is a safety-critical activity for marine operations. |

### 7.2.4 Environmental Impact Assessment

| Description | |
|---|---|
| **Receptors** | • physical environment/marine fauna)<br>• socio-economic (commercial or recreational users),<br>• cultural aspects (sea country, potential for totemic species). |
| **Consequence** | III – Moderate |
| Ballast water is responsible for 20–30% of all marine pest incursions into Australian waters. However, research indicates biofouling (the accumulation of aquatic micro-organisms, algae, plants and animals on vessel hulls and submerged surfaces) has been responsible for more foreign marine introductions than ballast water (DAFF, 2011). IMS, if successfully established, can outcompete native species for food or space, prey on native species or change the nature of the environment and can subsequently impact on fisheries or aquaculture.<br>If an IMS is introduced, it has been known to colonise areas beyond its initial introduction site. In the event of an IMS introduction in the OAs, the limited diversity and extent of similar benthic habitats in the region would result in only a minor reduction in the physical environment. No threatened ecological communities are present in the OAs that could be impacted. The overall consequence level was assessed as III – Moderate. Vessel ballast water exchange must be conducted in line with Australian Ballast Water Management Requirements. | |
| **Likelihood** | a-Remote |

| Description | |
|---|---|
| The pathways for IMS introduction are well understood, and standard preventive measures are therefore proposed. The ability of invasive marine species to colonise a habitat depends on various environmental conditions. Research has shown that highly disturbed environments (such as marinas) are more susceptible to colonisation than open water environments, where high levels of dilution and dispersal occur (Paulay et al., 2002). Given the depth of the OAs (85–265 m), which creates an unfavourable environment for colonisation (e.g. light-limiting conditions and low habitat biodiversity with sparse epibiota), and its distance from shallow coastal habitats, the likelihood of IMS surviving translocation and establishing is very low.<br>Additionally, due to the dispersive nature of the open-ocean environment within the OAs, the successful translocation of an IMS to surrounding shallower habitats is unlikely. With control measures in place, such as inspecting all infrastructure prior to departure from the yard, the risk of introducing invasive marine species is minimised, making the likelihood of introduction considered remote. | |
| **Residual Risk** | Very Low |

### 7.2.5 Demonstration of as Low as Reasonably Practicable

There are no alternatives to using a MODU and support vessels to undertake the activity. The risk of introducing IMS through vessel movements is well understood, and several standard control measures (Table 7-3) have been adopted to ensure that the risk is reduced to ALARP. Ballast water will be managed in alignment with the Australian Ballast Water Management Requirements, and vessels will undergo a biosecurity risk assessment in accordance with *Santos' Invasive Marine Species Management Plan* to demonstrate low IMS risk. Additionally, vessels will have compliant anti-foulant systems in place to prevent the accumulation of organisms that could introduce marine pests, and all vessels will meet Santos' marine assurance standard, which ensures they are operated, maintained, and manned in accordance with industry and regulatory expectations.

Santos has adopted a risk-based approach to managing biofouling, recognising that it is neither practical nor reasonable to inspect and clean every vessel before each voyage. This approach is consistent with industry best practice across the North West Shelf and is more robust than requirements placed on most commercial and recreational vessels operating in the same region. International vessels are prioritised for assessment and management due to their higher risk, while domestic vessels, including those operating interstate, are also risk-assessed to minimise the spread of established marine pests. This approach ensures compliance with the *Aquatic Resources Management Act 2016*, which prohibits the introduction of non-endemic species into WA waters.

Additional control measures (Table 7-3) were considered but not adopted where the cost, feasibility, or environmental trade-offs were grossly disproportionate to any potential benefit. This included heat or chemical treatment of ballast water, which may reduce IMS risk but could introduce new environmental hazards or cause mortality in native species, and were therefore considered counterproductive. Contracting only MODUs and vessels already operating in Australian waters was also not adopted, as it could result in limited vessel availability, significant delays, and higher costs. Similarly, mandatory dry docking of vessels prior to field entry was deemed unfeasible due to substantial cost and schedule implications, especially given that standard controls already manage the risk effectively. Prohibiting ballast water discharge and using alternative ballast systems were also assessed but not adopted as impractical or incompatible with marine operations; ballast water exchange is a safety-critical function for vessel and MODU stability and cannot be eliminated.

With adherence to the proposed management controls, the residual risk of IMS introduction is considered very low and the impact is reduced to ALARP.

### 7.2.6 Acceptability Evaluation

| | |
|---|---|
| **Is the risk ranked between Very Low to Medium?** | Yes – introduction of IMS residual risk ranking is Very low. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' *Environmental Hazard Identification and Assessment Procedure*, which considers principles of ESD.<br>The residual risk for this aspect is Low and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5 |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – management consistent with *Biosecurity Act 2015*, and associated regulations, *Australian Biofouling Management Requirements* guideline- Version 2 (DAFF, 2023), *National Biofouling Management Guidance for the Petroleum Production and Exploration Industry* (Marine Pest Sectoral Committee, 2018) and the *Aquatic Resources Management Act 2016*. |

| | |
|---|---|
| | Controls implemented will minimise the potential impacts to species identified in recovery plans and conservation advice. |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | There were no concerns raised during consultation on the EP. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

The mobilisation of MODU/vessels and equipment to undertake offshore activities is industry standard practice, and the IMS risks are well understood and subject to regulation. The vessels and equipment that are internationally mobilised will meet Australian biosecurity requirements, and proposed management is consistent with *National Biofouling Management Guidance for the Petroleum Production and Exploration Industry* (Marine Pest Sectoral Committee, 2018) and *Australian Biofouling Management Requirements* (DAWE, 2022).

Application of the proposed control measures and adherence to legislation and regulations reduce the likelihood of introducing invasive species into the OAs and surrounding islands, and the dispersive offshore location in the operational area reduces the probability of successful establishment in the unlikely event of introduction.

No stakeholder concerns have been raised regarding this aspect, and the proposed controls will reduce the residual level of risk to very low and ALARP. Therefore, the residual risk associated with IMS is considered by Santos to be environmentally acceptable.

# 7.3 Marine Fauna Interactions

## 7.3.1 Description of Event

| | |
|---|---|
| **Event** | There is the potential for vessels or equipment from the vessels involved in operational activities to interact with marine fauna, including potential strike or collision, potentially resulting in injury or mortality.<br>Bird strike may also occur from helicopters during take-off and landing. |
| **Extent** | Within the OAs, in the immediate vicinity of the vessels, or helicopters, while moving. |
| **Duration** | Constant:<br>• Support vessel operations will be regularly occurring during the drilling activity.<br>Infrequent and one-off:<br>• Vessel use if required for equipment or material delivery that is not part of a regular supply.<br>• Helicopter presence occurs for crew changes up to three times a week or during emergency situations.<br>Concurrent:<br>• Up to two MODUs (in separate OAs) and their support vessels operating at a time (Section 2.1). |

## 7.3.2 Nature and Scale of Environmental Impacts

Potential receptors: Threatened or migratory fauna (marine mammals, marine turtles, sharks and rays, fish, and birds) and cultural receptors (potential for totemic species), cultural receptors (totemic species).

Movement of the vessels in the operational areas introduces the potential for interaction with marine fauna present at the same location during the activity. Marine fauna in surface waters that would be most at risk from vessel collision include marine mammals and marine turtles. As summarised in Table 3-10, the OAs overlap several BIAs, including the whale shark foraging BIA, white tailed tropicbird reproduction BIA, brown booby reproduction BIA and lesser frigatebird reproduction BIA. The Mestrel/Bancroft OA is also directly adjacent to the reproduction (internesting buffer) BIA for flatback turtles (Figure 3-17).

Where two MODUs and support vessels operate concurrently in separate OAs, there is a potential for more instances of marine fauna interactions, However, the OAs are located >11 km from each other and are in an open ocean environment with no impediments to the movement of marine fauna to avoid MODUs and support vessels in the OAs.

Vessel strike and vessel disturbance are identified as potential threats to a number of marine fauna species in relevant recovery plans and conservation advice (Table 3-11).

### 7.3.2.1 Marine Mammals and Sharks/Rays

Humpback whales are one of the most frequently reported whale species involved in vessel strikes worldwide (Laist et al., 2001; Jensen & Silber, 2003). This observation is supported by Australian studies referenced in The National Strategy for Reducing Vessel Strike on Cetaceans and Other Marine Megafauna (DoEE, 2017a). The increase in vessel numbers (Silber & Bettridge, 2012) is not only a threat to humpback whales in relation to vessel strikes but also in relation to disturbance and displacement from key habitats. Similarly, the *Conservation Management Plan for the blue whale* (CoA, 2015b), along with the Approved Conservation Advice for the fin whale (*Balaenoptera physalus*) (TSSC, 2015b) and the sei whale (*Balaenoptera borealis*) (TSSC, 2015c), identifies vessel strikes as a threat to their recovery (Table 3-11).

The most commonly sighted whale in continental shelf waters of the region is the humpback whale, however, the humpback whale migration BIA is located ~13 km from the Mestrel/Bancroft OA (closest OA to the BIA). The humpback whale migrates between calving grounds in the Kimberley region of Western Australia to feeding grounds in Antarctica, with the northbound migration from early June to early August and the peak of the northbound migration between Exmouth Gulf and the Dampier Archipelago occurring around July, concentrated inshore of the 200-m depth contour (Jenner et al., 2001). The southern migration peaks around early September, with pods travelling in shallower waters, typically at 30–100 m and passing west of Barrow Island and north of the Montebello Islands. Whilst the OAs are outside the migration BIA the species may be encountered in the OA closer to the BIA (Mestrel/Bancroft; see Figure 3-11) during the humpback whale southern migration given the water depth (<100 m).

Pygmy blue, sei, Bryde's, orca and/or fin whales may also transit through the OAs, although OAs are outside the blue whale migration corridor in the region (DoEE, 2017a) and the BIA is 9 km to the north of the closest OA (Currie OA). Given the water depths in the OAs (ranging from ~80–265 m), it is unlikely there will be significant numbers of these species encountered during the activity.

The worst potential impact from vessel collision would be mortality or serious injury of an individual. Collisions between vessels and cetaceans are most frequent on continental shelf areas where high vessel traffic and cetacean habitat occur simultaneously (WDCS, 2006). Instances of cetacean deaths as a result of vessel collisions in Australian waters have been recorded (e.g. a Bryde's whale in Bass Strait in 1992) (WDCS, 2006), although the data indicates this is likely to be associated with container ships and fast ferries. The Whale and Dolphin Conservation Society also indicates that some cetacean species, such as humpback whales, can detect and change course to avoid a vessel (WDCS, 2006). The reaction of whales to the approach of a ship is quite variable. Some species remain motionless when in the vicinity of a ship while others are known to be curious and often approach ships that have stopped or are slow-moving, although they generally do not approach and sometimes avoid faster moving ships (Richardson et al., 1995).

Whale sharks are at risk from vessel strikes when feeding at the surface or in shallow waters (where options to dive are limited). The OAs overlaps the whale shark foraging BIA, therefore individuals may be encountered during activities. However, the whale shark presence within the OAs is not expected to comprise significant numbers given that no main aggregation area exists within the OAs, therefore, their presence would be transitory and of a short duration. No constraints within the OAs (e.g. shallow water or shorelines) would prevent whale sharks from moving away from vessels. Vessel speed has been demonstrated to be a key factor in relation to collision with marine fauna, particularly cetaceans, with faster-moving vessels posing a greater collision risk than slower vessels (Laist et.al., 2001; Jensen & Silber, 2003; Hazel, 2009). Laist et al. (2001) suggest the most severe and lethal injuries to cetaceans are caused by vessels travelling at 14 knots or faster.

#### 7.3.2.2 Marine Turtles

Turtles may be encountered in the OAs and a reproduction (internesting buffer) BIA is directly adjacent to Mestrel/Bancroft OA (Figure 3-17). However, the nearest known turtle nesting beach (Bedout Island) is ~65 km from the closest OA (Mestrel/Bancroft). In addition, based on tagging studies and depth observations (Whittock et al. 2016; Thums et al. 2018), it is unlikely that internesting flatback turtles would be present in significant numbers within the OAs given the water depths (80–265 m). Marine turtle and vessel interactions arising from increased vessel traffic is recognised as one of a number of key threats to marine turtles in the Recovery Plan for Marine Turtles (Commonwealth of Australia, 2017).

Marine turtle mortality from vessel strikes has been recognised as an issue in Queensland waters, as noted in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017). However, turtles are more susceptible to vessel strikes in areas with high urban populations, where the use of pleasure craft is more frequent. In contrast, Western Australia's turtle populations have not been identified as being heavily impacted by vessel strikes, likely due to the lower human population density along the NWS coastline.

Turtles will typically avoid vessels by rapidly diving; however, their ability to respond varies greatly depending on the speed of the vessel. Hazel (2009) reported that the number of turtles that fled vessels decreased significantly as vessel speed increased. Turtles are also adapted to detect sound in water (Popper et al., 2014) and will generally move from anthropogenic noise-generating sources, including vessels, within their detection range.

#### 7.3.2.3 Seabirds

A number of protected species of marine birds have potential habitats or migratory routes in and around the OAs (Section 3.2.6). In addition, the OAs overlap breeding BIA of lesser frigate bird, white tailed tropic and brown booby (refer Table 3-10).

The number of helicopter flights required to support activities is relatively low and flights occur in the daylight, thereby reducing potential interactions with birds. The risk of helicopter strike is not high because helicopter noise is expected to elicit a behavioural response in birds to avoid collision and because of the relatively low speeds at which helicopters would be flying during take-off or landing.

#### 7.3.2.4 Cultural receptors

Totemic species of cultural value may pass through the OAs; however, during consultation, Santos was not made aware of any other cultural receptors within the OAs. Impacts to marine fauna and seabirds have been considered in Sections 7.3.2.2and 7.3.2.3.

### 7.3.3 Environmental Performance Outcomes

The EPO relating to this event is

- No injury or mortality to EPBC Act and BC Act listed marine fauna during activities [BB-EPO-05]

The control measures for this event are shown in Table 7-4, and the EPS and measurement criteria for this EPO are described in Table 8-2.

**Table 7-4: Control measure evaluation for marine fauna interaction**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-23 | Santos procedure for interacting with marine fauna | Administrative | Reduces risk of physical and behavioural impacts to marine fauna from vessels and helicopters. If marine fauna is sighted, vessels can slow down or move away, and helicopters can increase distances from sighted fauna if required. | Operational costs to adhere to marine fauna interaction restrictions, such as vessel and helicopter speed and direction, are based on legislated requirements and must be accepted. | **Adopted** Benefits in reducing impacts to marine fauna outweigh the costs incurred by Santos. Control measure ensures compliance with Part 8 of the EPBC Regulations. |
| BB-CM-26 | Vessel bridge crew receive induction in marine fauna observations and marine fauna interaction requirements | Administrative | Reduces risk of physical and behavioural impacts to marine fauna from a vessel, because if they are sighted, then the vessel can slow down or move away. | Minor additional costs associated with induction/training material and time. | **Adopted** Benefits in reducing noise impacts. |
| BB-CM-27 | VAP procedures (including marine fauna observation) | Administrative | Reduces the likelihood of significant noise exposure to marine fauna (cetaceans, whale sharks and turtles) | May result in short delays to VAP operations if marine fauna are detected within the defined exclusion zone. Additional resources required for trained observers and soft start procedures. | **Adopted** Benefits outweigh costs. |
| **Additional Control Measures** | | | | | |
| N/A | Restrict the timing of activities to operate outside of sensitive periods only | Substitute | Potentially reduce risk of collisions (causing harm) during environmentally sensitive periods for listed marine fauna. | High cost in moving or delaying schedule while the risk to all listed marine fauna cannot be reduced due to variability in timing of migration periods and unpredictable presence of some species. | **Not adopted** Grossly disproportionate to low incremental environmental benefit given existing low level of risk. |
| N/A | Activities will only occur during daylight hours | Eliminate | Reduced potential for a vessel-fauna collision occurring as activities only undertaken during daylight hours when visibility highest. | Lengthens duration of the activity as operations only continue for ~10 hours per day. Increased cost due to increased activity time (more than double the cost). Lengthened schedule results in increased impacts and risks | **Not adopted** Substantial additional cost due to doubling of activity duration. No overall environmental benefit as results in increased impacts and risks. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | (e.g. planned emissions and discharges, interference with other marine users, etc.). | |
| N/A | Dedicated MMO on vessels (EPBC Policy Statement 2.1 Part B) | Protective | Improved ability to spot and identify marine fauna at risk of collision (that may cause harm). | Additional cost of contracting several specialist MMO. | **Not adopted** Cost disproportionate to increase in environmental benefit and would severely limit operations, which are required to occur 24 hours a day, 7 days a week. |
| N/A | Adopt further measures to those outlined in 'EPBC Regulations 2000 — Part 8 Division 8.1 during peak periods of ecological sensitivity, for example, additional management considerations for vessels outlined in the Australian National Guidelines for Whale and Dolphin Watching (DoEE, 2017c) | Eliminate | Potentially provide an additional level of protection of marine fauna. | Administrative costs to update existing procedure. Operational costs through interruption to activities through implementation of controls developed for an industry trying to get close to marine fauna, when Santos activities aim to avoid fauna. | **Not adopted** The existing control 'procedure for interacting with marine fauna' has been written in accordance with the EPBC Act and other relevant guidelines. A review of this procedure against the *Australian National Guidelines for Whale and Dolphin watching* (DoEE, 2017c) found that there are no additional relevant controls in the *Australian National Guidelines for Whale and Dolphin watching* and therefore adopting this control is not ALARP. |

### 7.3.4 Environmental Impact Assessment

| Description | |
|---|---|
| **Receptors** | • threatened or migratory fauna (marine mammals, marine turtles, sharks and rays, fish, and birds)<br>• cultural receptors (potential for totemic species) |
| **Consequence** | II-Minor |
| The potential for injury or mortality to marine fauna exists in the event of a collision or entanglement during operations. However, the number of individuals present in the OA is anticipated to be limited, primarily to transient species. Although the OA intersects the whale shark foraging BIA (Figure 3-9) and Mestrel/Bancroft OA is directly adjacent to the reproduction (internesting buffer) BIA for flatback turtles (Figure 3-17), the presence of significant numbers of these species is not expected. The OAs are outside the migration BIAs for humpback whale and pygmy blue whale.<br>Potential threats, including vessel strikes and disturbances, have been identified for various marine species within relevant Recovery Plans and Conservation Advice. The information provided indicates that with the established control measures, the activity will be conducted in a manner that reduces potential impacts to ALARP and maintains them at an acceptable level. | |

| Description | |
|---|---|
| There is also the potential for the death or injury of species listed under the EPBC Act. However, such occurrences are expected to affect only a small proportion of the local population and are unlikely to result in a significant decrease in population size beyond natural variation.<br>Where two MODUs and support vessels operate concurrently in separate OAs, there is a potential for more instances of marine fauna interactions, However, the OAs are located >11 km from each other and are located in an open ocean environment with no impediments to the movement of marine fauna to avoid MODUs and support vessels in the OAs.<br>Therefore, the loss of an individual would likely have only a minor consequence at both local and regional scales. | |
| **Likelihood** | C-Possible |
| Marine turtles, marine mammals and birds, receptors are expected to be present in the OAs at various times of the year.<br>Vessels will either remain stationary or move at very slow speeds while operating within the OAs, presenting a low risk of collisions with marine fauna. Furthermore, the noise produced by vessel operations will discourage marine fauna from approaching. With appropriate controls in place to ensure compliance with EPBC Regulations, the likelihood of a collision or entanglement with marine fauna, resulting in minor consequences, is assessed as C – Possible. | |
| **Residual Risk** | Low |

### 7.3.5 Demonstration of as Low as Reasonably Practicable

The use of vessels is critical to carrying out the planned activities, with no viable alternatives available. The likelihood of encountering EPBC Act-listed marine fauna within the OAs is inherently low due to the short duration of operations, the low density of surface fauna in these offshore areas, and the distance from recognised high-use habitats. Several standard control measures (Table 7-4) have been adopted to manage the risk of vessel interactions with marine fauna and reduce potential impacts to ALARP. This includes the implementation of a procedure for interacting with marine fauna, consistent with Part 8 of the EPBC Regulations 2000. This procedure requires vessel crews to modify their operations (e.g. reduce speed or alter course) when marine fauna such as cetaceans or whale sharks are sighted, and ensures helicopters maintain appropriate distances if fauna are observed. Vessel bridge crew will receive an induction that includes information on marine fauna observations and marine fauna interaction requirements. These measures reduce the risk of both physical injury and behavioural disturbance to marine fauna.

Santos has adopted a control measure to use a marine fauna observer as part of VAP activities (BB-CM-27). Prior to conducting VAP, a fauna observation period will be undertaken by a crew member on the MODU who has received training in sighting and reporting of marine fauna. Fauna observers are typically stationed on the heli-deck to take advantage of clearer views and greater height for better ability to observe any nearby fauna.

This will be performed for a minimum of 30 minutes within 3 hours of the (VAP) commencing. If fauna are detected within the exclusion zone, the activity will be shut down until they move on. Any nearby support vessels will also be asked to report any marine fauna sightings at this time.

Additional control measures (Table 7-4) were considered but not adopted where the cost, feasibility, or operational consequences were grossly disproportionate to any potential benefit. Restricting activities to operate outside of sensitive periods was Not adopted, as marine fauna presence is highly variable and not reliably predictable, while shifting activity timing would result in substantial scheduling delays without delivering measurable environmental benefit. Similarly, restricting operations to daylight hours only was not adopted because it would more than double the campaign duration, increasing vessel movements, emissions, discharges, and potential interference with other marine users. The use of dedicated MMOs was assessed but not adopted, as the cost and logistical burden of continuous coverage would be disproportionate to the low likelihood of fauna presence, particularly given existing controls. Finally, adopting further measures from the *Australian National Guidelines for Whale and Dolphin Watching* (DoEE, 2017c) was deemed unnecessary, as these guidelines are intended for activities aiming to observe fauna, whereas Santos' operations are designed to avoid them. A review confirmed that Santos' current fauna interaction procedures already meet or exceed the relevant elements of these guidelines.

With the adopted controls in place and no additional reasonable or practicable measures identified, the residual risk of vessel interactions with marine fauna is considered Low, and the impact is deemed reduced to ALARP.

### 7.3.6 Acceptability Evaluation

| | |
|---|---|
| **Is the risk ranked between Very Low to Medium?** | Yes – marine fauna interaction residual risk ranking is Low. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with *Santos' Environmental Hazard Identification and Assessment Procedure*, which considers principles of ESD. |

| | |
|---|---|
| | The residual risk for this aspect is Low and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – management consistent with Part 8 of the EPBC Regulations. Controls implemented will minimise the potential impacts to species identified in recovery plans and conservation advice.<br>Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-11, including but not limited to the:<br>• *Recovery Plan for Marine Turtles in Australia 2017-2027* (Commonwealth of Australia, 2017)<br>• *Approved Conservation Advice for Balaenoptera borealis (sei whale)* (TSSC, 2015b)<br>• *Approved Conservation Advice for Balaenoptera physalus (fin whale)* (TSSC, 2015c)<br>• *Conservation Management Plan for the Blue Whale: A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999 2015-2025* (Commonwealth of Australia, 2015)<br>• *Approved Conservation Advice for Rhincodon typus (whale shark)* (TSSC, 2015d) |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | During the public comment period, comments were raised regarding marine fauna interaction. These matters are addressed in Section 7.3.5. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

The movement of the MODU and vessels is unavoidable to undertake the activity. Vessel strikes are a well-understood risk in maritime operations, including commercial shipping and fishing. All vessel operations will comply with relevant maritime standards and EPBC regulations to minimise risks to marine fauna. The implementation of proposed management controls, along with adherence to Commonwealth regulations, reduces the likelihood of vessel interactions with marine fauna.

In accordance with Santos' reporting requirements, any impact within an OA will be reported in the National Ship Strike Database (see Table 8-2). With the proposed control measures in place, the potential impacts and risks to threatened fauna will be effectively minimised in accordance with relevant Recovery Plans and Approved Conservation Advice. No concerns were raised regarding this activity during stakeholder consultation. The risk is considered to be ALARP and environmentally acceptable.

# 7.4 Non-hydrocarbon and Chemical Releases

## 7.4.1 Description of Event

| | |
|---|---|
| **Event** | Non-hydrocarbon liquids including miscellaneous chemicals and waste streams (brine, mixed cement, cleaning and cooling agents, stored or spent chemicals and leftover paint materials) are used or stored on-board the MODU/vessels during the activities.<br>An accidental release of chemicals and other non-hydrocarbons liquids into the marine environment can occur from:<br>• MODU activities (including drilling fluids)<br>• transferring, storing or using bulk products (e.g. wet/mixed cement)<br>• mechanical failure of equipment<br>• handling and storage spills and leak<br>• hose or hose connection failure or leak<br>• lifting – dropped objects damaging liquid vessels (containers)<br>The presence of non-hydrocarbons liquids and chemicals represents a potential spill risk during chemical storage and handling e.g. due to tank damage, or human error. Another credible spill is due to a hose that parts when loading/offloading brine. Rupture of the pumping hose used to transfer these chemicals may occur due to dropped object, vessel motion, or hose failure. |
| **Extent** | Volumes are likely to be small and limited to the volume of individual containers (e.g. IBC, 44-gallon drums) stored on the deck of vessels or the MODU. The worst-case credible scenario, however, would be the accidental release of a MODU mud pit (~100 $m^3$) in any one pit for a nominal MODU.<br>Dilution from discharges in open waters is rapid, with 1 in 1,000 dilution usually occurring within 30 minutes (Costello and Read, 1994). Therefore, the relative low volumes are expected to rapidly disperse into the marine environment within the OAs.<br>Below toxic/harmful threshold concentrations are expected to occur at short distances from the chemical / hydrocarbon spill / release point. Impacts beyond the OAs in which it was released are not expected to occur. |
| **Duration** | Potentially toxic/harmful threshold concentrations limited to a very short period immediately following release, i.e. in the order of hours. |

## 7.4.2 Nature and Scale of Environmental Impacts

**Potential Receptors**: Physical environment (water quality) threatened migratory or local fauna (cetaceans, turtles, sharks, fish, rays, seabirds and shorebirds, benthic fauna, plankton), socio-economic receptors, cultural receptors (totemic species).

### 7.4.2.1 Physical Environment

Non-hydrocarbon liquids or chemicals released to the marine environment may lead to contamination of the water column in the vicinity of the MODU and vessels. The potential impacts would most likely be highly localised and restricted to the immediate area surrounding the release, with rapid dispersal to concentrations below impact thresholds likely to occur in the open ocean.

Due to the small volumes involved and the expected rapid dispersal to concentrations below impact thresholds, significant effects on water quality are unlikely, preventing any consequential impacts on sediment quality or benthic habitats, including reefs and offshore islands. Additionally, there are no emergent or intertidal habitats at risk from a surface or subsea spill. Given the water depth and offshore location, it is improbable that any spilled material would reach the shoreline or impact benthic habitats.

### 7.4.2.2 Threatened, Migratory or Local Fauna

Changes to water quality could potentially lead to short-term impacts on marine fauna (e.g. pelagic fish and sharks, marine mammals, marine reptiles and seabirds). The OAs overlap several BIAs including whale shark foraging BIA and migratory birds (reproduction BIA) as detailed in Table 3-10. The Mestrel/Bancroft OA is directly adjacent to the reproduction (internesting buffer) BIA for flatback turtles (Figure 3-17).

Recovery plans and conservation advice for various bird species highlight marine pollution and contamination as significant threats. Similarly, the *Recovery Plan for Marine Turtles in Australia 2017–2027* (Commonwealth of Australia, 2017) identifies declining water quality as a threat to all marine turtle species in Australia. These species may occasionally be present within the OAs.

Chemical spills are unlikely to cause widespread ecological harm to threatened or migratory fauna due to the nature of the chemicals on board, the small volumes that could be released, and the open-ocean environment. The risk of physical coating of marine fauna, particularly those at the sea surface (e.g. seabirds), by hazardous liquids,

or sublethal or lethal effects from toxic chemicals, is considered low, given the anticipated low concentrations and short exposure times.

#### 7.4.2.3 Socio-economic Receptors

Given the localised and temporary impacts of an unplanned hazardous liquid spill, any impact to other marine users and their activities is considered unlikely.

#### 7.4.2.4 Cultural receptors

Totemic species (marine fauna and seabirds) are likely to move through the OAs. Chemical spills are unlikely to cause widespread ecological harm to fauna due to the nature of the chemicals on board, the small volumes that could be released, and the open-ocean environment. The risk of physical coating of marine fauna, particularly those at the sea surface (e.g. seabirds), by hazardous liquids, or sublethal or lethal effects from toxic chemicals, is considered low, given the anticipated low concentrations and short exposure times.

### 7.4.3 Environmental Performance Outcomes and Control Measures

The EPO relating to this event include:

- No unplanned objects, emissions or discharges to sea or air [BB-EPO-06]

The control measures for this event are shown in Table 7-5, and the EPSs and measurement criteria for the EPOs are described in Table 8-2.

**Table 7-5: Control measure evaluation for non-hydrocarbon and chemical releases**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-46 | Dropped object prevention procedures | Administrative | Minimises dropped Impacts to environment are reduced by preventing dropped objects and by retrieving dropped objects unless the environmental consequences are negligible or there are risks to safety.<br>Minimises drop risk during lifting operations.<br>Ensures lifting equipment is certified and inspected. | Personnel costs to maintain lifting equipment and implement procedure. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweighs costs. |
| BB-CM-47 | Hazardous chemical management procedures | Administrative | Reduces the risk of spills and leaks (discharges) to the sea by controlling the storage, handling, and clean-up of hazardous chemicals. | Personnel costs associated with permanent or temporary storage areas. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time. |
| BB-CM-36 | General chemical management procedure | Administrative | Potential impacts to the environment are reduced through following correct procedures for the safe handling and storage of chemicals. | Personnel costs associated with ensuring procedures are in place and implemented. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh the |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | | costs of personnel time. |
| BB-CM-48 | International Maritime Dangerous Goods Code | Administrative | Dangerous goods managed in accordance with International Maritime Dangerous Goods Code to reduce the risk of an environmental incident, such as an accidental release to sea or unintended chemical reaction. | Personnel costs associated with implementation of code/procedure. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh costs.<br>It is a legislative requirement. |
| BB-CM-51 | MODU and support vessel spill response plans | Administrative | Implements a response plan to deal with an unplanned hydrocarbon spill quickly and efficiently in order to reduce impacts to the marine environment. | Personnel cost associated with ongoing management (spill response exercises) and implementation of plans. | **Adopted**<br>Benefits of ensuring response plans in place, are followed and measures implemented and that the vessels are compliant outweighs costs. |
| BB-CM-37 | Chemical selection procedure | Administrative | Reduces the impact on water quality (reduced toxicity) in the marine environment in the event of an unplanned release. Only environmentally acceptable products are used | Cost associated with implementation of procedure. Range of chemicals reduced but potentially higher costs. Potential additional cost and delays of chemical substitution. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time. |
| BB-CM-25 | Vessel planned maintenance system | Engineering | Reduces potential for unplanned releases of chemicals from the vessels because equipment is operating within its parameters. | Costs are standard for routine PMS. | **Adopted**<br>Benefits outweigh the cost. |
| BB-CM-24 | MODU planned maintenance system | Administrative | MODU equipment is operating within its parameters, reducing the risk of unplanned discharges to the marine environment. | Costs are standard for routine PMS. | **Adopted**<br>Benefits in reducing atmospheric emissions impacts outweigh the minimal costs. |
| BB-CM-52 | Bulk solid transfer procedure | Administrative | Bulk solids transferred in accordance with bulk transfer procedures to reduce the risk of an unintentional release to the sea. | Cost to implement ongoing procedure. Cost of purchasing and maintaining equipment (e.g. bulk hoses and connections). | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweighs costs. |
| BB-CM-53 | Bulk liquid transfer procedure | Administrative | Bulk liquid transferred in accordance with | Cost of implementing procedure. Cost of | **Adopted**<br>Benefits of ensuring |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | bulk transfer procedures to reduce the risk of an unintentional release to the sea. | purchasing and maintaining equipment (e.g. bulk hoses and connections). | procedures are followed and measures implemented outweighs costs. |
| **Additional Control Measures** | | | | | |
| N/A | Eliminate vessel to vessel lifting in field. | Eliminate | Reduces the risk release of hydrocarbon to the marine environment from hydrocarbon containers or secondary impact with hydrocarbon containing equipment due to dropped objects. | Eliminating lifting would require MODU/vessels storing more equipment and supplies on-board, and/or additional trips to shore. MODU/vessels will not have enough deck space to store all required equipment, materials, supplies needed for the duration of the activity. | **Not Adopted**<br>Not feasible to eliminate lifting in field. |

### 7.4.4 Environmental Impact Assessment

| Description | |
|---|---|
| **Receptors** | • physical environment (water quality)<br>• threatened migratory or local fauna (cetaceans, turtles, sharks, fish, rays, seabirds and shorebirds, benthic fauna, plankton)<br>• socio-economic receptors. |
| **Consequence** | I – Negligible |
| In the event of a non-hydrocarbon liquid or chemical spill, the quantity of a worst-case liquid release is unlikely to be >1 $m^3$ (the size of the largest storage container) for all chemicals other than drilling fluid, and up to 100 $m^3$ of drilling fluids from the mud pit. Dilution and dispersion from natural weathering processes such as ocean currents indicate that the extent of exposure will be limited in area and duration. Furthermore, most of the drilling fluids that are planned to be used will be water-based muds therefore having low impact on the marine environment (see Section 6.7)<br>The susceptibility of marine fauna to non-hydrocarbon liquids and chemicals is dependent on the type and exposure duration; however, given that exposures would be limited in extent and duration, exposure to marine fauna from this hazard is not expected to result in a fauna fatality. Impacts from discharges to the marine environment to water quality would be short-term and localised, due to the nature and behaviour of the chemicals identified as being at risk of spilling, only pelagic fauna present in the immediate vicinity of the spill would likely be at risk of impact.<br>Habitat degradation, declining water quality and marine pollution are identified as potential threats to marine species (Table 3-11) that may inhabit the OAs, the proposed control measures are expected to prevent significant impacts from non-hydrocarbon liquid of chemicals spills on the receiving environment.<br>EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.<br>Given that a non-hydrocarbon or chemical spill would not result in short term behavioural impacts to marine fauna to small portion of the local population size it is expected that a spill of this nature would result in a I – Negligible consequence. | |
| **Likelihood** | C – Possible |
| A small release of non-hydrocarbon liquids is unlikely to have widespread ecological effects due to the nature of the chemicals on board, the small potential release volume, the depth and transient presence of marine fauna in the area, and the effective prevention and management procedures for spill response.<br>Santos has reviewed historical non-hydrocarbon liquid spills and leaks from equipment and machinery, such as those caused by split hoses, minor leaks, or handling errors. Most reported incidents occurred within bunded areas, involved volumes <100 L, did not enter the marine environment, and were cleaned up immediately.<br>The likelihood of a small hazardous liquids release occurring is limited given the set of mitigation and management controls in place for this program. Consequently, the likelihood of releasing hazardous liquids to the environment, which results in a negligible consequence, is considered to be C – Possible. | |
| **Residual Risk** | Very Low |

### 7.4.5 Demonstration of as Low as Reasonably Practicable

The use of non-hydrocarbon hazardous liquids and chemicals is essential to undertake the activity, and their complete removal from operations is not feasible. These substances are required for safe and effective drilling, maintenance, and vessel operations. Several standard control measures (Table 7-5) have been adopted to manage the risks associated with the storage, handling, and potential release of hazardous liquids, and to reduce the likelihood and consequence of any unplanned discharges to ALARP. Dangerous chemicals will be managed in accordance with the International Maritime Dangerous Goods Code, and procedures for the transfer of bulk liquids are in place to minimise the risk of accidental releases resulting from equipment failure, overfilling, or operational error.

Comprehensive administrative controls have been implemented, including solid bulk transfer procedure, hazardous and general chemical management procedures, which govern safe storage, handling, and clean-up practices. The chemical selection procedure ensures that only environmentally acceptable products are used, thereby reducing the potential impact to marine water quality in the event of an accidental release. Dropped object prevention procedures are also applied to reduce the risk of spills resulting from equipment movement or transfer between vessels. In the event of a spill, MODU and support vessel spill response plans are in place to ensure a rapid and effective response to minimise environmental harm.

Engineering controls further reduce risks through the use of bunding and onboard containment systems, as outlined in each vessel's SMPEP, and through the implementation of PMS for both the MODU and support vessels. These systems ensure that relevant equipment is inspected, maintained, and operating within its design limits to minimise the likelihood of failure and associated releases. Regular inspections of bunding, drainage systems, and spill kits provide assurance that these controls remain effective.

Additional control measures (Table 7-5) were considered but not adopted where they were found to be impractical or grossly disproportionate. For example, eliminating vessel-to-vessel lifting in the field was not adopted as it would require vessels to carry significantly more supplies onboard or make frequent return trips to port, neither of which are feasible due to space limitations and logistical constraints. Increased vessel movements would also lead to higher emissions, cost, and operational risk, without providing a commensurate environmental benefit.

The controls proposed are consistent with applicable legislative requirements, relevant conservation advice, and Santos' internal risk management criteria. With the adopted measures in place and no additional feasible controls identified, the residual risk associated with non-hydrocarbon hazardous liquids and chemicals is considered Very Low, and the impact is reduced to ALARP.

### 7.4.6 Acceptability Evaluation

| | |
|---|---|
| **Is the risk ranked between Very Low to Medium?** | Yes-residual risk is ranked Very Low |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' *Environmental Hazard Identification and Assessment Procedure*, which considers principles of ESD.<br>The residual risk for this aspect is Very Low and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – management consistent with Marine Order 94 (Marine pollution prevention – packaged harmful substances) and with relevant recovery plans and conservation advice for species that may occur in the OAs.<br>Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-11. |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | There were no concerns raised during consultation on the EP. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

With the controls in place to prevent an accidental release of small volumes of non-hydrocarbon liquids and chemicals and the minor impacts predicted from an unplanned release of such material, the risk to the marine

environment is considered low. Potential risks are unlikely to be greater than those caused by other commercial marine vessels or offshore activities in deep water.

The materials will be managed in accordance with relevant legislation and standards and Santos' procedures. The small volumes negate the need for any further contingencies to be in place that are included for some of the larger spill scenarios associated with the activity.

With the controls in place to prevent accidental spills and the low impacts predicted from a spill of this size, the environmental risk of using and handling the required chemicals is considered ALARP and environmentally acceptable.

# 7.5 Overview of Unplanned Release of Hydrocarbons

There is the potential for:

- loss of well control (subsea and surface) resulting in a loss of natural gas and Caley crude (assessed in detail, in Section 7.6).
- loss of containment of marine diesel oil (MDO) due to a vessel collision event or refuelling activities within an OA (assessed in detail, in Section 7.7).
- minor spills of control fluids, lubricant oils, waste oils etc. (assessed in detail in Section 7.8).

Hydrocarbon trajectory modelling was used to predict the potential extent of a worst-case spill event for both the MDO spills and LOWC scenarios at select well locations within the OAs (RPS, 2025).

**Table 7-6: Summary of Largest Credible Hydrocarbon Spill Scenarios**

| Maximum Credible Scenario | Hydrocarbon Type | Maximum Credible Volume | EP Section |
|---|---|---|---|
| Loss of well control causing a crude release from a wellhead at surface | Caley crude | 8,600,000 bbl (1,367,291 $m^3$) | Section 7.6 |
| Loss of well control causing a crude release from a wellhead at subsea | Caley crude | 2,600,000 bbl (413,367 $m^3$) | Section 7.6 |
| Release of diesel from a vessel fuel tank (due to vessel collision or dropped object) in Commonwealth waters | Marine diesel | 325 $m^3$ | Section 7.7 |
| Minor hydrocarbon release | Marine diesel, oil and hydraulic oil | 1 $m^3$ | Section 7.8 |

## 7.5.1 Spill Scenario Selection

### 7.5.1.1 Loss of Well Control

Santos has identified a LOWC as the worst-case type of credible oil release scenario that could potentially occur during the activity. A LOWC incident may discharge directly to the sea surface or at the seabed, depending on the type of failure that occurs and the type of MODU (jack up or semi-submersible). A release of Caley crude oil over a period of 77 days is considered the worst-case scenario due to LOWC and this scenario applies to wells drilled in any OA. Site-specific worst case LOWC volumes were calculated and modelled at designated release locations over three OAs (see Section 7.5.2.1).

### 7.5.1.2 Vessel Collision

It is considered credible that a release of MDO to the marine environment could occur from a collision between the activity vessels and an errant third-party vessel. Such events could have sufficient impact to result in the rupture of a diesel tank leading to a loss of integrity. This is considered credible given the diesel tanks may not be protected or double-hulled and fuel tank ruptures resulting in a hydrocarbon release have occurred before within the maritime industry.

The *Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities* (AMSA, 2015) recommend that the spill scenario for modelling and impact assessment should be based on the largest single fuel tank volume. A review of the contracted vessel fuel oil tank layout confirmed that the largest single fuel tank is 325 $m^3$ in capacity. This scenario applies to any OA and a modelled spill volume of 325 $m^3$ has therefore been used for this EP.

### 7.5.1.3 Refuelling

A minor spill (~37.5 $m^3$) of MDO could occur during vessel to MODU refuelling resulting in a release of hydrocarbons to the marine environment at the sea surface. Spills during refuelling can occur through several pathways, including fuel hose breaks, coupling failure or tank overfilling.

Spills resulting from overfilling will be contained within the vessel or MODU drains and slops tank system. In the event that the refuelling hose is ruptured, the fuel bunkering activity will cease by turning off the pump, the fuel remaining in the transfer line will escape to the environment as well as fuel released prior to the transfer operation being stopped. The *Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities* (AMSA, 2015) provides guidance for calculating a maximum credible spill volume for a refuelling spill. The guidance provided by AMSA (2015) for a refuelling spill under continuous supervision is considered appropriate given refuelling will be constantly supervised.

The maximum credible spill volume during refuelling is calculated as:

transfer rate (150 $m^3$/hr) × 15 minutes of flow

The detection time of 15 minutes is seen as conservative but applicable following failure of multiple barriers, followed by manual detection and isolation of the fuel supply.

### 7.5.2 Spill Modelling Overview

To determine the spatial extent of impacts from potential hydrocarbon spills, modelling was completed for the LOWC scenarios and vessel collision scenario (RPS, 2025). A surface spill of MDO during refuelling is considered relatively small in comparison to a surface spill of MDO during a vessel collision. It is therefore assumed that the extent of a hydrocarbon spill during refuelling would remain within the extent of the worst-case spill trajectory of diesel from a vessel collision, subsequently, modelling of a smaller spill was not conducted.

In the studies, oil spill modelling was undertaken using a three-dimensional oil spill trajectory and weathering model, SIMAP (Spill Impact Mapping and Analysis Program), which is designed to simulate the transport, spreading and weathering of specific oil types under the influence of changing meteorological and oceanographic forces. For the subsea release near-field subsurface discharge modelling was undertaken using OILMAP, which predicts the centreline velocity, buoyancy, width and trapping depth (if any) of the rising gas and oil plumes. A total of 300 individual 'realisations' made up the full stochastic simulation set for loss of well control spill scenarios, while 300 realisations made up the stochastic simulation for the vessel collision spill scenario. So, for the LOWC and vessel collision scenario's, each modelled at three different locations, there is a total of 1,800 individual realisations used in the oil spill modelling.

For each set of stochastic realisations, SIMAP spatially tracked the surface oil, entrained oil in the water column, dissolved oil and oil on shorelines.

The outputs of this modelling showed a number of different possible outcomes of a spill, which were then analysed to determine the concentrations of hydrocarbon at each grid cell of the model, providing information about the probability of contact and concentration at contact of hydrocarbons across the EMBA.

Each stochastic model was created by overlaying individual hypothetical oil spill simulations from a hypothetical oil spill into a single map, with each simulation subject to a different set of metocean conditions drawn from actual historical metocean and climate records.

All of the modelled worst-case scenarios (e.g. loss of well control and vessel collision) were combined to create a single socio economic EMBA and ecological EMBA, of which, the socio economic EMBA represents the greatest spatial extent.

While the EMBA outlines the maximum potential spatial extent of all modelled spill scenarios, a deterministic model, which uses a single simulation from the stochastic modelling (e.g. the 1,367,291 $m^3$ surface release of Caley crude scenario), more realistically represents a single spill event's much smaller spatial footprint. Therefore, deterministic modelling was also performed to understand the potential area of influence that could be expected from a single spill event. An example deterministic run for each modelled LOWC scenario (representing a LOWC in the Ara OA, Curie OA and Mestrel/Bancroft OA) is provided in Appendix H.

#### 7.5.2.1 LOWC Spill Modelling

Caley crude could be released to the environment from either a surface or subsea LOWC event. Quantitative hydrocarbon spill modelling was undertaken for the worst-case subsea and surface spill discharge rates and volumes to inform the environmental impact assessment and to assist with emergency planning. To ensure a conservative assessment of the potential environmental impact, site-specific worst-case volumes were calculated for wells in each OA. The modelled release locations at three of four OAs were carefully selected based on their proximity to nearby sensitive receptors, including reefs, islands and coastlines (Figure 7-1). A LOWC within the Wallace OA was not modelled due to its similar release location to the Curie OA maximum credible scenario (Figure 7-1), and it being a significantly smaller volume than the Ara and Mestrel/Bancroft OAs surface LOWC scenarios (Table 7-7).

LOWC scenarios were modelled over 77 days and are presented in Table 7-7. Surface or subsea scenarios were modelled dependant on which had the highest calculated worst-case volume.

**Table 7-7: Summary of worst-case spill scenarios for surface and subsea LOWC scenarios**

| OA | Release depth | Maximum Credible Volume ($m^3$) | Water depth (m) | Spill duration | Modelling duration | Number of spill simulations |
|---|---|---|---|---|---|---|
| Ara | Surface | 1,017,519 | ~200 | 11 weeks (77 days) | 14 weeks (98 days) | |
| Mestrel/Bancroft | Surface | 1,367,291 | ~100 | | | |

| OA | Release depth | Maximum Credible Volume ($m^3$) | Water depth (m) | Spill duration | Modelling duration | Number of spill simulations |
|---|---|---|---|---|---|---|
| Curie | Subsea | 413,367 | ~160 | | | 300 total (100 per season) |
| Wallace | Surface | 413,385 | ~160 | Not modelled | | |

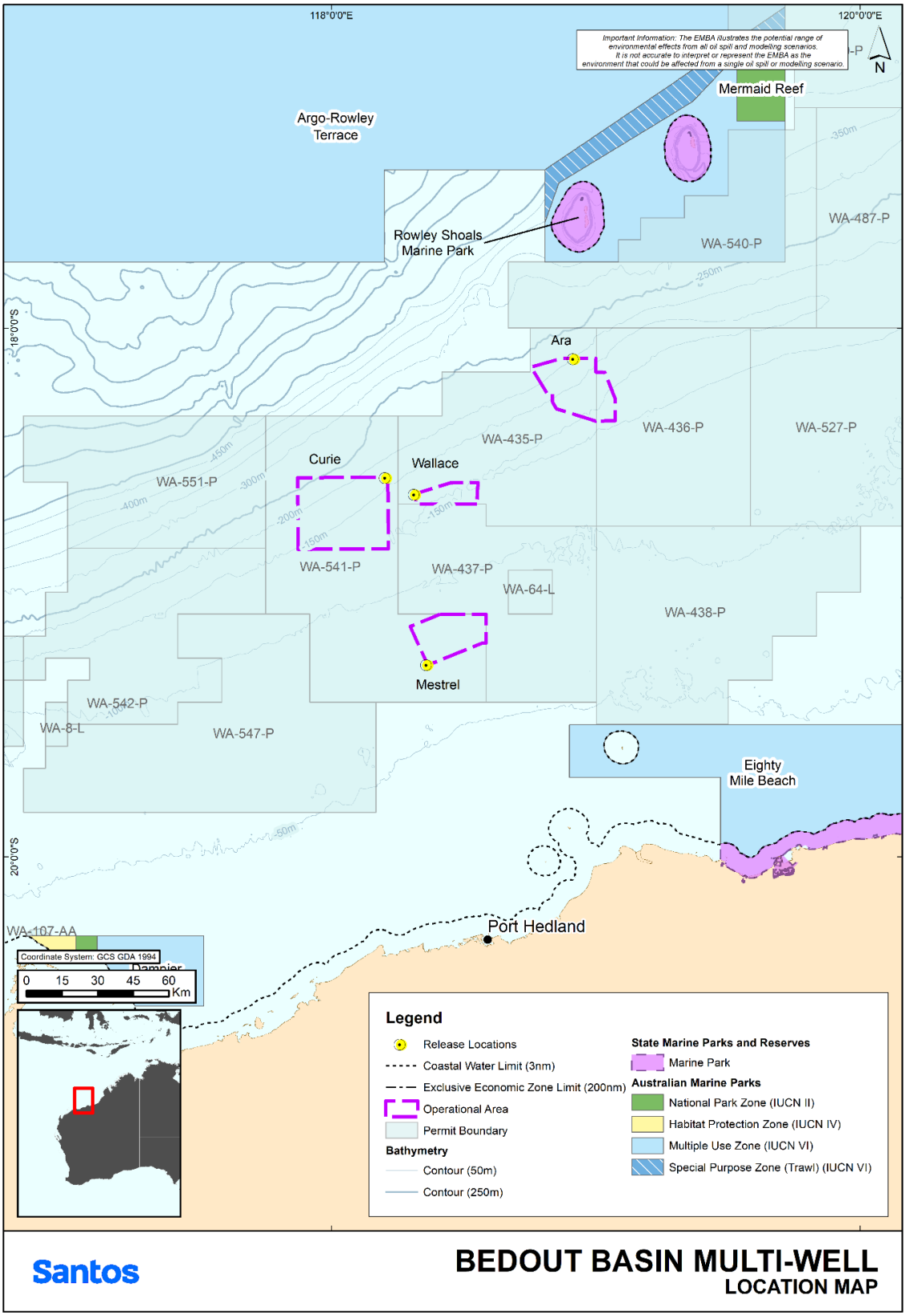



**Figure 7-1: Release locations within the OAs**

### 7.5.2.2 Vessel Collision

Quantitative spill modelling was undertaken for the worst-case credible spill from a vessel collision (325 $m^3$) (see Section 7.5.1.2). Key attributes of this scenario are summarised in Table 7-8. The scenario was based on the loss of the entire contents of the single largest tank of a vessel, as recommended by AMSA (2015). Modelling locations were selected based on the same principle as described in Section 7.5.2.1 above.

**Table 7-8: Summary of modelled vessel collision spill scenario**

| OA | Release depth | Maximum Credible Volume ($m^3$) | Water depth (m) | Spill duration | Modelling duration | Number of spill simulations |
|---|---|---|---|---|---|---|
| Ara | Surface | 325 | ~200 | 1 hour | 30 days | 300 total (100 per season) |
| Mestrel/Bancroft | Surface | | ~100 | | | |
| Curie | Subsea | | ~160 | | | |

## 7.5.3 Hydrocarbon Characteristics

### 7.5.3.1 Caley Crude

Caley crude is a very light crude, which has an API of 51.4, a density of 773 kg/$m^3$ (at 15 °C) and a low viscosity value of 1.45 cP (at 20 °C). When exposed to the atmosphere at local temperatures, ~48% of the product, which are the volatile components, is expected to evaporate within the first 12 hours (BP <180 °C); a further 19%, the semi-volatiles, should evaporate within the first 24 hours (180 °C < BP <265 °C); and the low volatile portion (18%) should evaporate within weeks (265 °C < BP <380 °C). Additionally, 15% of the crude is shown to persist in the marine environment for much longer periods and would be subject to relatively slow degradation.

Hence, due to the percentage of persistent components (15%) with a boiling point above 370 °C, Caley crude is considered a Group II light persistent oil as presented in the AMSA (2023) categorisation. However, it should be noted that Caley crude also has properties that align it with a Group I oil as per the ITOPF (2023) classifications.

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

It's noteworthy that the heavier components for Caley crude, specifically the low volatile and persistent portions, will have a strong tendency to become entrained into the water column in the presence of moderate winds (>10 knots) and in turn breaking waves, however, it can re-surface under calm conditions (<10 knots).

A summary of the representative characteristics of Caley crude is provided in Table 7-9 and Table 7-10.

**Table 7-9: Characteristics of Caley crude**

| Properties | Caley crude |
|---|---|
| Density (kg/$m^3$) | 773 (at 15 °C) |
| API | 51.4 |
| Dynamic viscosity (cP) | 1.45 (at 20 °C) |
| Wax content (%) | 9.2 |
| Pour point (°C) | −15 |
| Hydrocarbon property category | Group II |
| Hydrocarbon property classification | Light persistent |

**Table 7-10: Boiling point ranges for Caley crude**

| | Volatiles (%) | Semi-volatiles (%) | Low volatiles (%) | Residual (%) |
|---|---|---|---|---|
| Boiling point | <180 | 180-265 | 265-380 | >380 |
| | Non persistent | | | Persistent |
| Caley crude | 48.0 | 19.0 | 18.0 | 15.0 |

**Caley crude weathering**

A series of weathering simulations have been undertaken illustrate the potential behaviour following a 50 $m^3$ instantaneous surface release of Caley crude when exposed to:

- 5 knot (2.6 m/s) constant wind speed, 27 °C water temperature and currents
- variable wind speeds (1–12 m/s or 2–23 knots), 27 °C water temperature and currents.

The first case is indicative of the potential weathering rates under calm conditions that would not generate entrainment, while the second case would be more representative of the moderate winds experienced over the region.

The mass balance forecast for the constant wind case (Figure 7-2) shows that 66% of the crude has evaporated within 24 hours. The remaining crude on the water surface will weather at a slower rate due to the lower volatile components. Evaporation of the residual compounds will slow considerably, and they will then be subject to more gradual decay through biological and photochemical processes.

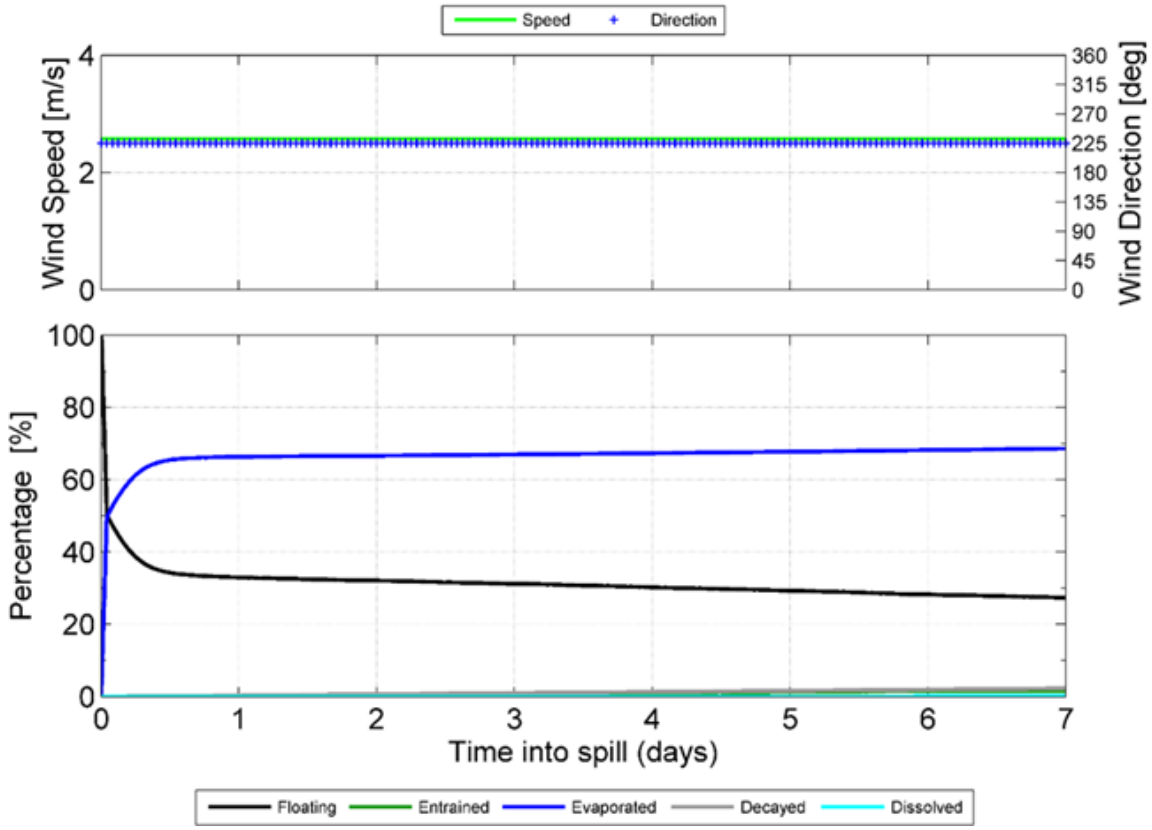



**Figure 7-2: Simulated weathering of a 50 m$^3$ surface release of Caley crude subjected to a constant 5 knot (2.6 m/s) wind**

For the variable wind speed case (Figure 7-3), after 24 hours, 39% of the crude mass will have entrained and a further 57% is shown to have evaporated, leaving only a small proportion of the crude floating on the water surface (~0.14%). The residual compounds will tend to remain entrained beneath the surface under conditions that generate wind waves. The increased level of entrainment in the variable wind speed case will result in a higher percentage of biological and photochemical degradation, where the decay of the floating slicks and crude droplets in the water column occurs at an approximate rate of 1.3% per day with an accumulated total of 8.8% after 7 days, in comparison to a rate of 0.3% per day and an accumulated total of 2.3% after 7 days in the constant-wind case. Given the proportion of entrained crude oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons will decay over time scales of several weeks.

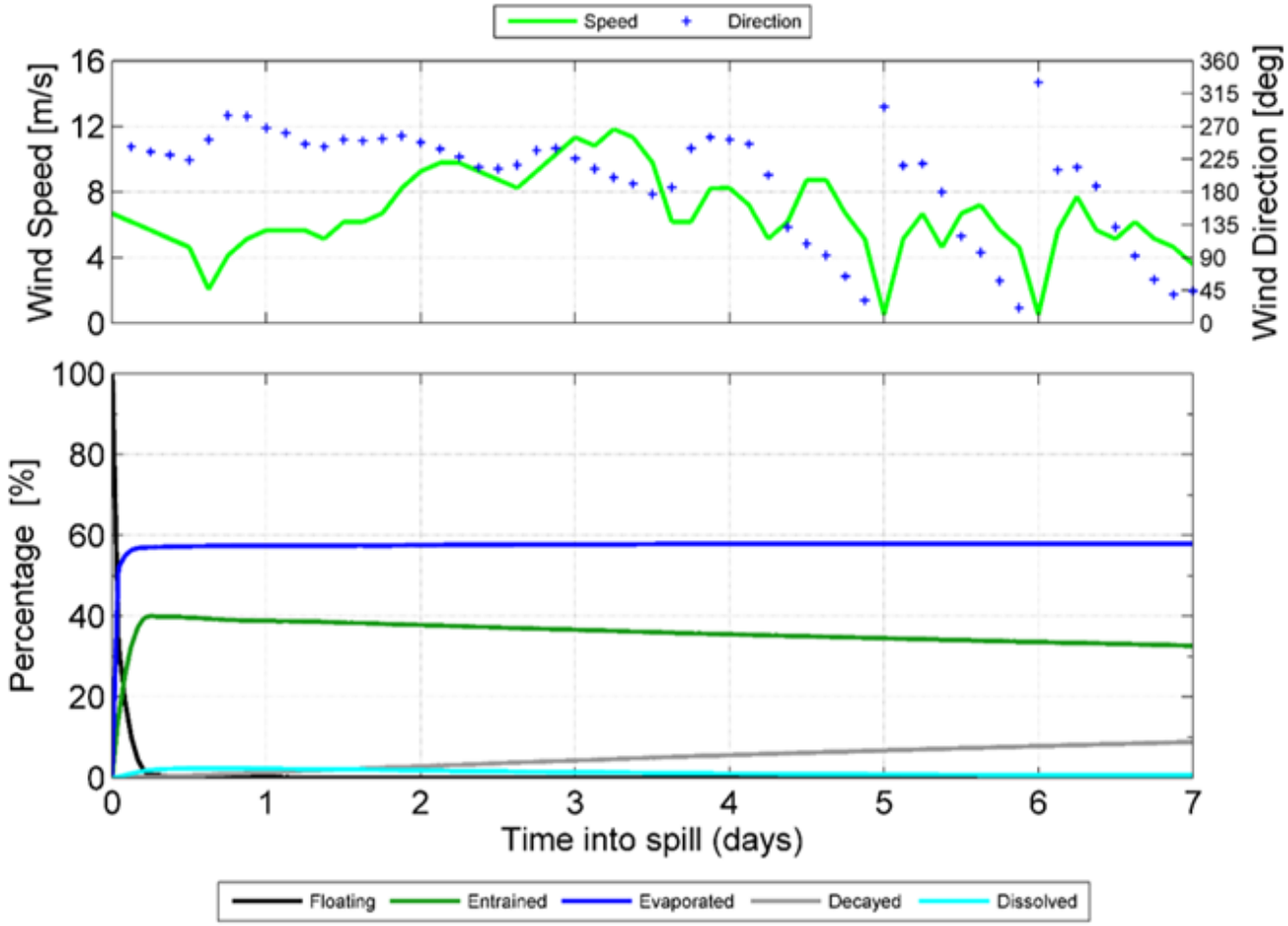



**Figure 7-3: Simulated weathering of a 50 m$^3$ surface release of Caley crude subjected to variable wind speeds**

### 7.5.3.2 Marine Diesel

International Tanker Owners Pollution Federation (2011b) and the Australian Marine Oil Spill Centre (AMOSC, 2011) categorise MDO as a light 'group II' hydrocarbon. In the marine environment, a 5% residual of the total quantity of MDO spilt will remain after the volatilisation and solubilisation processes associated with weathering. In the marine environment, MDO is expected to behave as follows:

- MDO will spread rapidly in the direction of the prevailing wind and waves, and evaporation will be the dominant process contributing to the fate of spilled MDO from the sea surface and will account for 60–80% reduction of the net hydrocarbon balance
- the evaporation rate of MDO will increase in warmer air and sea temperatures
- MDO residues usually consist of heavy compounds that may persist longer and will tend to disperse as oil droplets into the upper layers of the water column.

Upon release, the MDO is forecast to spread rapidly out to a thin film on the sea surface, and evaporation is forecast to remove ~50% of the released volume within several days of release. The MDO will also become increasingly subject to entrainment into the water column as the density increases after losing the lighter components through evaporation (RPS, 2025).

A summary of the representative characteristics of MDO is provided in Table 7-11 and Table 7-12.

**Table 7-11: Characteristics of MDO**

| Properties | MDO |
|---|---|
| Density (kg/m$^3$) | 890.0 (at 15 °C) |
| API | 27.5 |
| Dynamic viscosity (cP) | 14.0 (at 25 °C) |
| Wax content (%) | 1 |
| Pour point (°C) | −9.0 |

| Properties | MDO |
|---|---|
| Hydrocarbon property category | Group II |
| Hydrocarbon property classification | Light persistent |

**Table 7-12: Boiling point ranges for MDO**

| | Volatiles (%) | Semi-volatiles (%) | Low volatiles (%) | Residual (%) |
|---|---|---|---|---|
| Boiling point | <180 | 180–265 | 265–380 | >380 |
| | *Non persistent* | | | *Persistent* |
| MDO | 4.0 | 32.0 | 54.0 | 10.0 |

### MDO weathering

MDO is a moderate weight and moderately persistent oil in the marine environment. Weathering simulations undertaken for MDO showed that under constant low winds (2.6 m/s), 36.1% of the surface slick is predicted to evaporate in the first 24 hours. The remaining MDO on the water surface will weather at a slower rate and be subject to more gradual decay through biological and photochemical processes (Figure 7-4). Simulations showed under variable wind conditions, where the winds are of greater strength, entrainment into the upper water column is indicated to be significant. Approximately 80% is expected to entrain after 24 hours and further 15% is forecast to evaporate, leaving approximately <1% floating on the sea surface (Figure 7-5). MDO has a very low tendency for emulsion formation.

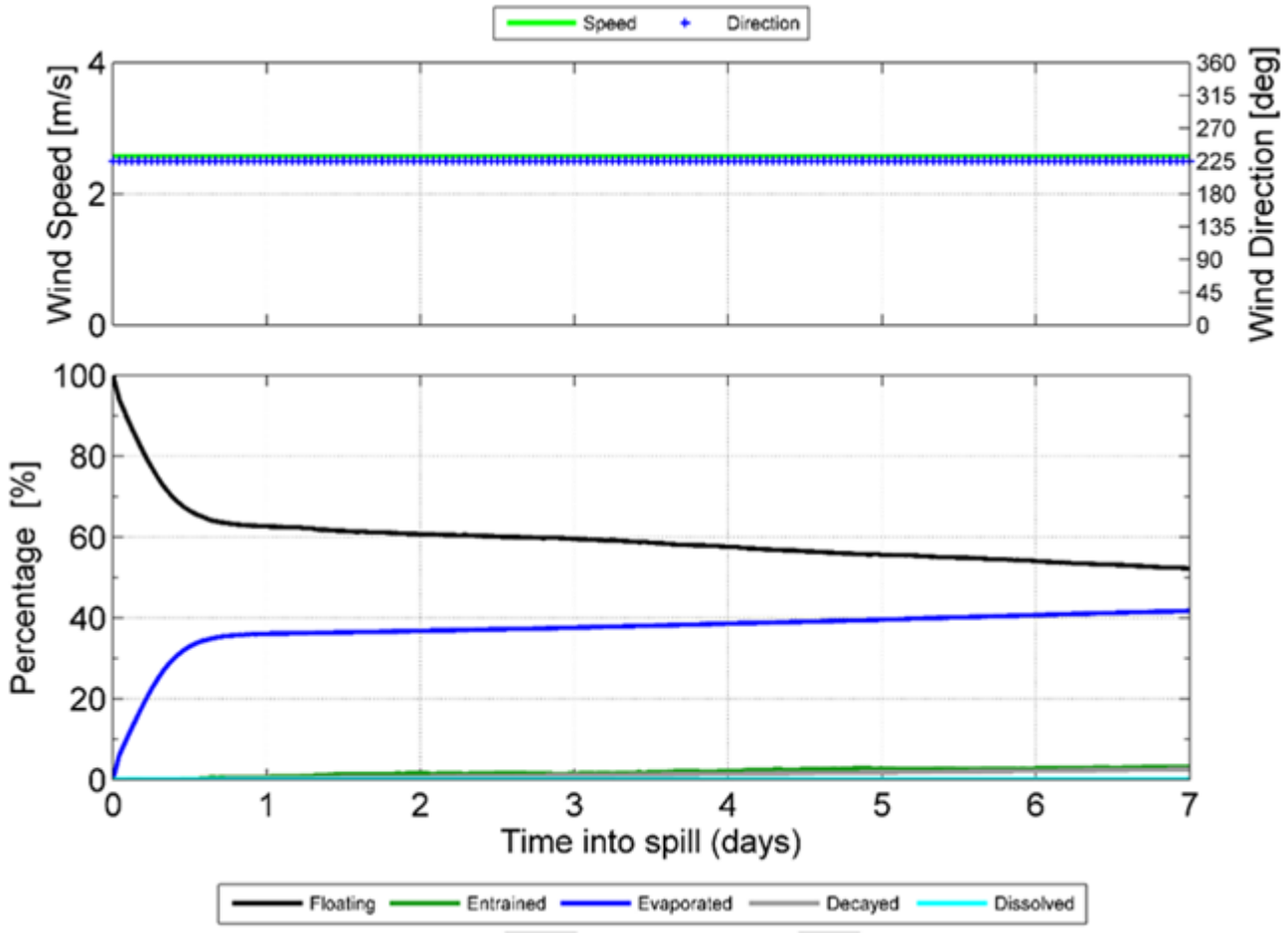



**Figure 7-4: Mass balance plot for an instantaneous 50 m$^3$ surface release of MDO subjected to a constant 5 knot (2.6 m/s) wind, currents and 27 °C water temperature**

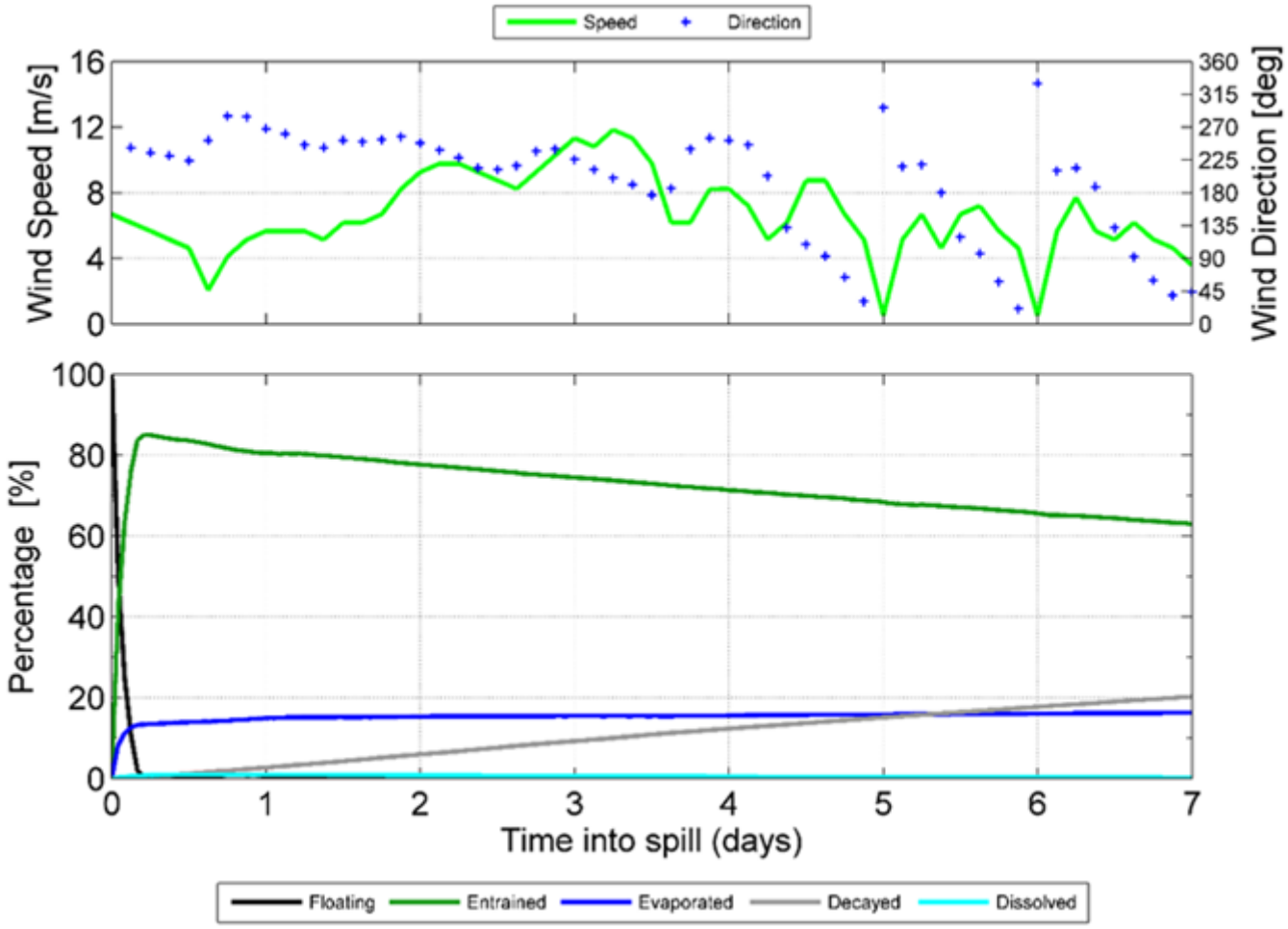



**Figure 7-5: Mass balance plot for an instantaneous 50 m$^3$ surface release of MDO subjected to variable wind speeds of 2–23 knots (1–12 m/s), currents and 27 °C water temperature**

### 7.5.4 Hydrocarbon Exposure Values

To inform the impact assessment it is important to understand the profile of the concentrations of hydrocarbons after a spill. To do this NOPSEMA recommends identifying hydrocarbon exposure values that broadly reflect the range of consequences that could occur at certain concentrations (NOPSEMA, 2025a). The exposure values that have been applied to this EP are described below.

The EMBA shown in Figure 3-1 was developed using the socio-economic exposure values in Table 3-1. These are considered appropriate for identifying the full range of environmental receptors that might be contacted by surface and/or subsurface hydrocarbons.

To inform impact assessment, exposure values that are considered representative of an ecological impact have also been identified. Ecological impact thresholds (Table 7-13 to Table 7-16) are modelled for each fate of hydrocarbon to identify what contact is predicted for surface (floating oil), subsurface (entrained oil and dissolved aromatic hydrocarbons), and shoreline accumulation of hydrocarbon at sensitivities. In this case the ecological EMBA has a similar footprint to the socio-economic EMBA, therefore the description of the environment in Section 3 was based on the socio-economic EMBA (it covers both extents).

Determining exposure values that may be representative of ecological impact is complex since the degree of impact will depend on the sensitivity of the receptors contacted, the duration of the exposure and the toxicity of the hydrocarbon type making the contact. The toxicity of a hydrocarbon will also change over time, due to weathering processes altering the composition of the hydrocarbon. To identify appropriate exposure values Santos has considered the advice provided by NOPSEMAs *Application of Oil Spil Modelling in Environment Plans – Information Paper* (NOPSEMA 2025a) and scientific literature. The selected hydrocarbon exposure values are discussed in Table 7-13 to Table 7-16. These tables explain how the exposure value is relevant to the risk evaluation and provides context on how that exposure value is used to inform response planning (which is addressed further in the OPEP).

**Table 7-13: Floating hydrocarbons exposure values**

| Surface oil concentration (g/m²) | Exposure value | Description |
|---|---|---|
| 1 | Low | **Risk Evaluation**<br>It is recognised that a lower floating oil concentration of 1 g/m² (equivalent to a thickness of 0.001 mm or 1 ml of oil per m²) is visible as a rainbow sheen on the sea surface. This represents a wider area where a visible sheen may be present on the surface and, therefore, the concentration at which socio-cultural impacts to the visual amenity of the marine environment may occur.<br>**Response Planning**<br>Contact at 1 g/m² (as predicted by oil spill trajectory modelling) is used as a conservative trigger for activating scientific monitoring plans as detailed in the OPEP. |
| 10 | Moderate | **Risk Evaluation**<br>There is a paucity of data on floating oil concentrations with respect to impacts to marine organisms. Hydrocarbon concentrations for registering biological impacts resulting from contact of surface slicks have been estimated by different researchers at about 10–25 g/m² (French et al., 1999; Koops et al., 2004). The impact of floating oil on birds is better understood than on other receptors. A conservative exposure value of 10 g/m² has been applied to impacts from surface hydrocarbons (floating oil) in this EP. Although based on birds, this hydrocarbon exposure value is also considered appropriate for turtles, sea snakes and marine mammals (NRDAMCME, 1996).<br>**Response Planning**<br>Contact at 10 g/m² is not specifically used for spill response planning. |
| 50 | High | **Risk Evaluation**<br>At greater thicknesses the potential for impact of surface oil to wildlife increases. All other things being equal, contact to wildlife by surface oil at 50 g/m² is expected to result in a greater impact.<br>**Response Planning**<br>Containment and recovery effectiveness drops significantly with reduced oil thickness (McKinney et al., 2017; NOAA, 2014). McKinney et al. (2017) tested the effectiveness of various oil skimmers at various oil thicknesses. Their results showed that the oil recovery rate of skimmers dropped significantly when oil thickness was <50 g/m² (less than Bonn Agreement Code 4). Hence, 50 g/m² has been set as a guide for planning effective containment and recovery operations.<br>Similarly, surface oil >50 g/m² (Bonn Agreement Code 4/5 and equivalent to oil observed as discontinuous or continuous true colour) is considered to be a lower limit for effective dispersant operations and is therefore considered for planning. |

**Table 7-14: Shoreline hydrocarbons accumulation exposure values**

| Shoreline oil concentration (g/m²) | Exposure value | Description |
|---|---|---|
| 10 | Low | **Risk evaluation**<br>10 g/m² shoreline accumulation represents a lower concentration for identifying social, economic and cultural features of the environment that may be affected by shoreline oil, and for assessing the potential consequences on these features. For example, reduction in visual amenity of shorelines. This value has been used in previous studies to represent a low contact value for interpreting shoreline accumulation modelling results (French-McCay, 2005a, 2005b).<br>**Response planning**<br>Not specifically used for response planning because below the limit that can be effectively cleaned. |
| 100 | Moderate | **Risk evaluation**<br>The impact exposure value for exposure to hydrocarbons stranded on shorelines is derived from levels likely to cause adverse impacts to marine or coastal fauna and habitats. These habitats and marine fauna known to use shorelines are most at risk of exposure to shoreline accumulations of oil, due to smothering of intertidal habitats (such as mangroves and emergent coral reefs) and coating of marine fauna. Environmental risk assessment studies (French-McCay, 2009) report that an oil thickness of 0.1 mm (100 g/m²) on shorelines is assumed as the lethal exposure value for invertebrates on hard substrates (rocky, artificial or |

| Shoreline oil concentration (g/m²) | Exposure value | Description |
|---|---|---|
| | | man-made) and sediments (mud, silt, sand or gravel) in intertidal habitats. Therefore, a conservative exposure value for impacts of 100 g/m² has been applied to impacts from shoreline accumulation of hydrocarbons.<br>**Response planning**<br>A shoreline concentration of 100 g/m², or above, is likely to be representative of the minimum limit that the oil can be effectively cleaned according (AMSA, 2015; NOPSEMA, 2025a) and is therefore used as a guide for shoreline clean-up planning. This exposure value equates to approximately ½ a cup of oil per square metre of shoreline contacted. |
| 1,000 | High | **Risk evaluation**<br>At greater thicknesses, the potential for impact of accumulated oil to shoreline receptors increases. All other things being equal, accumulation of oil above 1,000 g/m² is expected to result in a greater impact.<br>**Response planning**<br>As oil increases in thickness the effectiveness of oil recovery techniques increases. This value can therefore be used to prioritise oil recovery efforts, assuming oil recovery is deemed to have an environmental benefit. |

**Table 7-15: Dissolved hydrocarbon exposure values**

| Dissolved oil concentration (ppb) | Exposure value | Description |
|---|---|---|
| 10 | Low | **Risk evaluation**<br>Dissolved Aromatic Hydrocarbons (DAH) include the monoaromatic hydrocarbons (compounds with a single benzene ring such as benzene, toluene, ethyl benzene, and xylenes) and polycyclic aromatic hydrocarbons [PAHs] (compounds with multiple benzene rings such as naphthalenes and phenanthrenes). These compounds have a greater bioavailability than other components of oil and are considered to be the main contributors to oil toxicity. Acute toxicity studies (French-McCay 2025; Negri et al. 2021; Bejarano et al. 2017) demonstrate that, the 10 ppb dissolved exposure value is protective of >95% of species for acute exposures.<br>The toxicity of DAHs is a function of the concentration and the duration of exposure by sensitive receptors, with greater concentration and exposure time causing more severe impacts. Typically tests of toxicity done under laboratory conditions measure toxicity as a proportion of test organisms affected (for example, 50% mortality or LC50) at the end of a set time period, often 48 or 96 hours.<br>French-McCay (2002) in a review of literature, reported LC50 for dissolved PAHs with 96-hour exposure, range between 30 ppb for sensitive species (2.5$^{th}$ percentile species) and 2,260 ppb for insensitive species (97.5$^{th}$ percentile species), with an average of about 250 ppb. The range of LC50s for PAHs obtained under turbulent conditions (this includes fine oil droplets) was 6–410 ppb with an average of 50 ppb (French-McCay, 2002). 10 ppb dissolved also represents a conservatively low concentration that can cause toxic effects to sensitive species (French-McCay 2025, Bejarano et al. 2014; McGrath et al. 2018).<br>Dissolved hydrocarbons have a greater bioavailability than other components of the oil and are considered to exert the most toxic effects on aquatic biota as reviewed in detail by Carls et al. 2008; Nordtug et al. 2011; Redman 2017; Gobas et al. 2018, French McCay, 2023). Dissolved compounds are taken up into organisms directly through external surfaces and gills, as well as through the digestive tract. Thus, soluble and semi-soluble hydrocarbons and related compounds in oil are bioavailable, whereas insoluble compounds in oil (which remain in entrained droplets when in the water column) are not bioavailable to aquatic organisms. The low dissolved exposure value (10 ppb) was adopted to reduce the risk associated with bioavailability.<br>The dissolved hydrocarbon 10 ppb exposure value has been used to inform the socio-economic and ecological EMBAs within Section 3.<br>**Response planning**<br>Contact at 10 ppb (as predicted by oil spill trajectory modelling) is used as a trigger for activating scientific monitoring plans as detailed in the OPEP. Establishes planning area for scientific monitoring based on potential for exceedance of water quality triggers (NOPSEMA, 2025a). |

**Table 7-16: Entrained hydrocarbons exposure values**

| Entrained oil concentration (ppb) | Exposure value | Description |
|---|---|---|
| 10 | Low | **Response planning**<br>The 10 ppb exposure value has been used to inform the scientific monitoring planning area based on potential for exceedance of water quality triggers (NOPSEMA, 2025a). The adoption of the thresholds recommended in NOPSEMA's Application of Oil Spill Modelling in Environment Plans – Information Paper (NOPSEMA2025a) for the scientific monitoring planning area ensures adequate arrangements will be in place for responding and to and monitoring oil pollution.<br>Entrained hydrocarbons, as opposed to DAHs, are hydrocarbon droplets suspended in the water column and insoluble. Entrained hydrocarbons are not as bioavailable to marine organisms compared with DAHs and on that basis are considered to be less toxic, especially over shorter exposure timeframes. The more bioavailable components evaporate and dissolve (and potentially cause acute toxicity in water column), leaving residual (entrained) oil with much lower potential for causing adverse effects. Toxicity decreases (and effects levels increase) as the oil weathers since the bioavailable components are lost over time (French-McCay et al. 2023).<br>Entrained hydrocarbons still have potential effects on marine organisms through direct contact with exposed tissues and ingestion (National Research Council, 2005). However, the level of exposure causing effects is considerably higher than for DAHs.<br>Much of the published scientific literature does not provide sufficient information to determine if toxicity is caused by entrained hydrocarbons, but rather the toxicity of total hydrocarbons which includes both dissolved and entrained components. Variations in the methodology of the total water-accommodated fraction (entrained and dissolved) may account for much of the observed wide variation in reported exposure values, which also depend on the test organism types, duration of exposure, hydrocarbon type and the initial hydrocarbon concentration.<br>Total hydrocarbon toxicity acute effects of total hydrocarbon as LC50 for molluscs range from 500–2000 ppb (Clark et al., 2001; Long & Holdway, 2002). A wider range of LC50 values have been reported for species of crustacea and fish from 100 to 258,000,000 ppb (Gulec et al., 1997; Gulec & Holdway, 2000; Clark et al., 2001) and 45 to 465,000,000 ppb (Gulec & Holdway, 2000; Barron et al., 2004), respectively.<br>The 10 ppb exposure value has been used to inform the scientific monitoring planning area based on potential for exceedance of water quality triggers (NOPSEMA, 2025a). |
| 1,000 | High | **Risk Evaluation**<br>Entrained hydrocarbons, as opposed to DAHs, are oil droplets suspended in the water column. Factors including bioavailability of constituents in the oil, changing composition of the oil as it weathers, and likelihood and duration of exposure all contribute to the dynamic nature of entrained and dissolved oil aquatic toxicity at any given time in an oil spill scenario.<br>The toxicity of an oil hydrocarbon mixture is strongly related to the chemical composition of the oil. Oil weathering leads to a preferential loss of the toxic components of the oil (e.g. PAHs) because those components are volatile or semi-volatile and taken up by micro-organisms. The more bioavailable components evaporate and dissolve (and potentially cause acute toxicity in water column), leaving residual (entrained) oil with much lower potential for causing adverse effects. Toxicity decreases (and effects levels increase) as the oil weathers since the bioavailable components are lost over time (French-McCay et al. 2023). Therefore, effects levels for the bioavailable, soluble and semi-soluble components should not be applied to whole oil entrained droplets, particularly for weathered entrained oil droplets.<br>Entrained hydrocarbons still have potential effects on marine organisms through direct contact with exposed tissues and ingestion (NRC 2005). However, research has not definitively demonstrated direct effects of whole-oil droplets as separable from the effects of toxic components dissolved from the oil (Parkerton et al. 2023), and the level of exposure causing effects is considered to be significantly higher than for DAHs (NASEM 2020; French-McCay 2016, 2024).<br>A review by French-McCay (2025) on considerations for the development of entrained oil thresholds for oil spill risk assessments, recommends entrained thresholds based on total hydrocarbon content (THC) and related compounds. |

| Entrained oil concentration (ppb) | Exposure value | Description |
|---|---|---|
| | | However, given the variable composition of entrained oil as it weathers, the development of effects levels or thresholds based on THC is acknowledged to be problematic (French-McCay 2024).<br>Crude oils typically contain about 1% PAHs by mass (French-McCay 2002; Forth et al. 2017), therefore the sublethal concentration threshold (predicted no-effect concentration [PNEC]) expressed as THC based on the most toxic components would be ~100 ppb (100 µg/L) for fresh oil (French-McCay 2016). However, as oil weathers, PAHs are lost to volatisation, dissolution and biodegradation, thus making application of this threshold to entrained oil droplets overly conservative (as described above). In addition, exposure durations in the sea are brief, order of minutes to hours, not days or longer as used in most bioassay studies (Bejarano et al. 2017). Effects levels are orders of magnitude higher for exposure durations of <24 hours (French-McCay 2002).<br>Given these considerations, French-McCay (2025) suggests 1,000 ppb to be sufficiently conservative for entrained oil droplets of all oil types and all weathering states. This is supported by a number of toxicity studies including a review by Bejarano et al. (2017), which identified THC lethal effects levels of 3-28 mg/L (3,000–28,000 ppb) for a range of oils and states of weathering for aquatic species from all geographical areas globally. An exposure concentration of 1,000 ppb of measurable Total Petroleum Hydrocarbon (TPH) was deemed a low level of concern for sensitive life stages in marine organisms by Kraly et al. (2001). In reviews by NRC (2005) and NASEM (2020), 1,000 ppb was similarly found to be at the low end of the range where sub-lethal impacts from acute exposure have been observed.<br>French-McCay (2025) when referring to 'open ocean' refers to any oceanic environment including coastal and offshore environments, as opposed to shallow waters and enclosed embayments, such as ponds and inland waterways. It is acknowledged that embayments in coastal areas can act as low-energy, low-mixing environments where hydrocarbons may accumulate or persist. However, to accumulate the entrained oil would need to surface, come ashore or settle to sediments in these areas. While entrained in the water, the concentrations do not physically concentrate, rather they dilute by turbulent diffusion. However, the model does in fact evaluate entrained oil surfacing and accumulation of oil at the surface and in sediments such as in nearshore areas (which occurs along shorelines). Thresholds for floating and shoreline oil address these potential exposures and would identify areas where there would be potential for impacting sensitive species and their life stages.<br>Negri et al. (2025) reviewed the paper written by French-McCay (2025) and consider the 1,000 ppb THC to be a conservative threshold for defining an area that may be affected by entrained oil, particularly given short open ocean exposure durations and the reduction in oil droplet toxicity through weathering. |

### 7.5.5 Spill Risk Assessment Approach

The spill risk assessment approach adopted is based on *Santos' Oil Spill Risk Assessment and Response Planning Procedure* (SO-91-II-20003).

The Santos spill risk assessment approach provides a comprehensive risk assessment of all environmental values potentially contacted by an oil spill. In addition, it also considers environmental values combined with the severity of the spill impact to identify receptors for a more focussed risk assessment. The spill risk assessment process is as below and illustrated in Figure 7-6.

1. identify the spatial extent of the environment that may be affected (the EMBA). This has been completed for this EP as part of the assessment of the existing environment and receptors that are known to occur or may occur within the EMBA are described in Section 3.1 and Appendix C.
2. identify and priority rank the environmental values (EV) of the receptor areas within the EMBA
3. identify areas of high environmental value (HEV) within the EMBA (Priority ranks 1–3). Areas of high environmental value (HEVs) are described in Section 7.5.5.2
4. identify and risk assess the hotspots. Hotspots are effectively a subset of the HEVs, and their determination is described in Section 7.5.5.3
5. identify protection priority areas (PPAs) (see Section 7.5.5.4) based on the hotspots (refer Section 7.5.5.3) for spill response strategies.

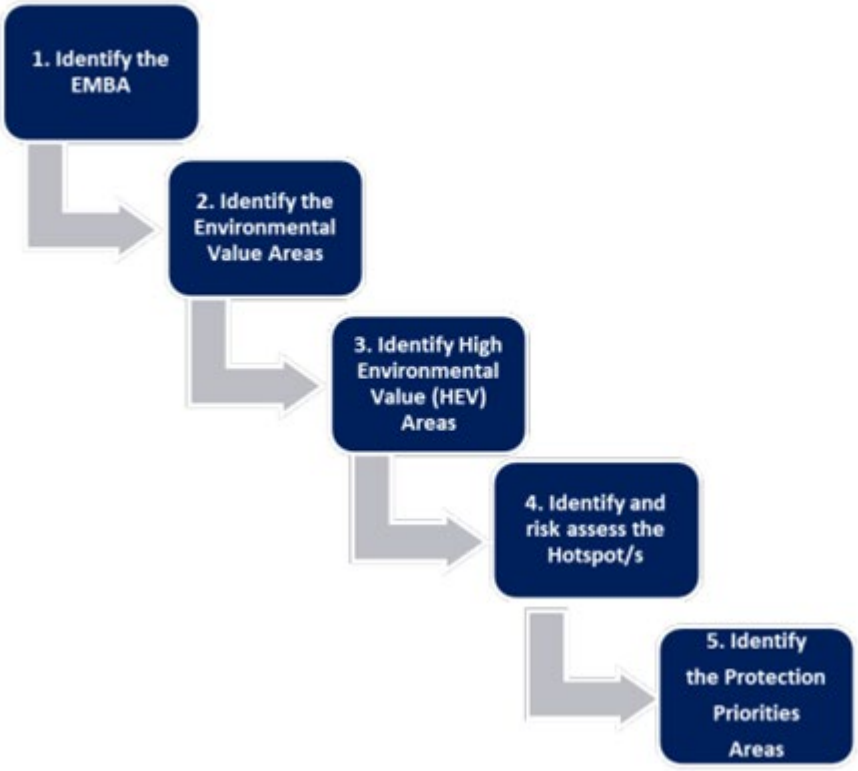



**Figure 7-6: Santos oil spill risk assessment approach**

### 7.5.5.1 Spill Environment that May be Affected

Defining the EMBA by an oil spill is the first step in oil spill risk and impact assessment. For activities where there is the potential for multiple spill scenarios, the spill scenario, or combination of spill scenarios, resulting in the greatest spatial extent is used to define the overall EMBA for the activity.

The EMBA is further described in Section 3.1.

### 7.5.5.2 Areas of High Environmental Value

Santos has predetermined areas of HEV along the Western Australian coastline by ranking these areas based on:

- protected area status – This is used as an indicator of the biodiversity values contained within that area, where a World Heritage Area, RAMSAR Wetland and Marine Protected Area will score higher than areas with no protection assigned.
- BIAs of listed threatened species – These are spatially defined areas where aggregations of individuals of a species are known to display BIBs, such as breeding, feeding, resting or migration. Each one of these within the predefined areas contributes to the score.

Further input to determine areas of HEV included:

- sensitivity of habitats to impact from hydrocarbons in accordance with the guidance document Sensitivity Mapping for Oil Spill Response produced by IPIECA, the International Maritime Organisation and International Association of Oil and Gas Producers
- sensitivities of receptors with respect to hydrocarbon-impact pathways
- status of zones within protected areas (IUCN (1A) and sanctuary zones compared to IUCN (VI) and multiple use zones)
- listed species status and predominant habitat (surface versus subsurface)
- social values, socio-economic and heritage features (such as commercial fishing, recreational fishing, amenities, aquaculture).

Tallied scores for each predefined area along the Western Australian coastline were then ranked from 1 to 5, with an assignment of 1 representing areas of the highest environmental value and those with 5 representing the areas of the lowest environmental value. HEVs for the worst-case oil spill EMBA are shown in Figure 7-7.

#### 7.5.5.3 Hotspots

While the entire EMBA will be considered during risk assessment and spill response planning, it is best practice to concentrate greatest effort and level of detail on those parts of the EMBA that have the:

- greatest intrinsic environmental value – considered by Santos to be HEV areas ranked 1 to 3
- highest probability of contact by oil (either floating, entrained or dissolved aromatic)
- greatest potential concentration or volume of oil arriving at the area.

These areas are termed 'hot spots'. Defining hotspots is typically the first step in undertaking detailed spill risk assessment and spill response planning. Hot spots are a subset of HEV areas that:

- have the highest probability of contact (at least higher than 5%) above the impact assessment exposure value for surface hydrocarbons and shoreline accumulation based on modelling results
- receive the greatest concentration or volume of oil, either floating or stranded oil, entrained oil or DAH above contact exposure values described in Section 7.5.4.

A workshop was held on 24 October 2024 to review the hotspots for the worst-case oil spill scenarios. During the workshop, additional hotspots may be included through discretion of workshop attendees where they do not strictly meet all of the above criteria. For example, an HEV ranked 1–3 with <5% probability, or an HEV ranked 4 or 5 with >5% probability, depending on the concentrations and volumes presented in the modelling report.

During the hotspot workshop, an environment consequence assessment is conducted against each of the hotspots identified using the Santos risk assessment process identified in Section 5, the outcome of this is provided in Appendix H2.

#### 7.5.5.4 Priorities for Protection

For the purposes of a spill response preparedness strategy, it is not necessary for all hotspots to have detailed planning. For example, wholly submerged hotspots may only be contacted by entrained oil, and the response would be largely to implement scientific monitoring to determine impact and recovery. Hotspots with features that are not wholly submerged (emergent features) should have specific spill response planning conducted. This final determination of 'Priority for Protection' sites, for the oil spill response strategy, is based on the worst-case estimate of floating oil concentration, shoreline loading and minimum contact time at exposure value concentrations.

The following Hotspot locations have been identified as Priorities for Protection areas for oil spill response planning and are based on the worst-case estimate of surface oil concentration, shoreline loading and minimum contact time at exposure value concentrations for the Bedout multi-well drilling activities:

- Clerke Reef MP
- Imperieuse MP

The oil spill response strategies for the Priority for Protection areas are included within the activity OPEP (7720-650-EMP-0006).

An assessment of each protection priority will be undertaken to determine the most appropriate spill response strategies based on the type of oil and the values of the protection priority area. This can be done through a strategic NEBA approach.

#### 7.5.5.5 Potential Hydrocarbon Impact Pathways

To help inform the hydrocarbon spill risk assessment receptors within the EMBA and potential impact pathways have been defined (Table 7-17). The potential impact pathways consider physical and chemical pathways. Physical pathways include contact from floating oil, accumulated shoreline oil, or entrained oil droplets. Chemical pathways include ingestion, inhalation or contact from any hydrocarbon phase. These are summarised in Table 7-18 and the information is drawn upon within the hydrocarbon risk assessment for the spill scenario. Table 7-18 further describes the nature and scale of the hydrocarbon spills for this activity on marine fauna and socio-economic receptors found within the EMBA.

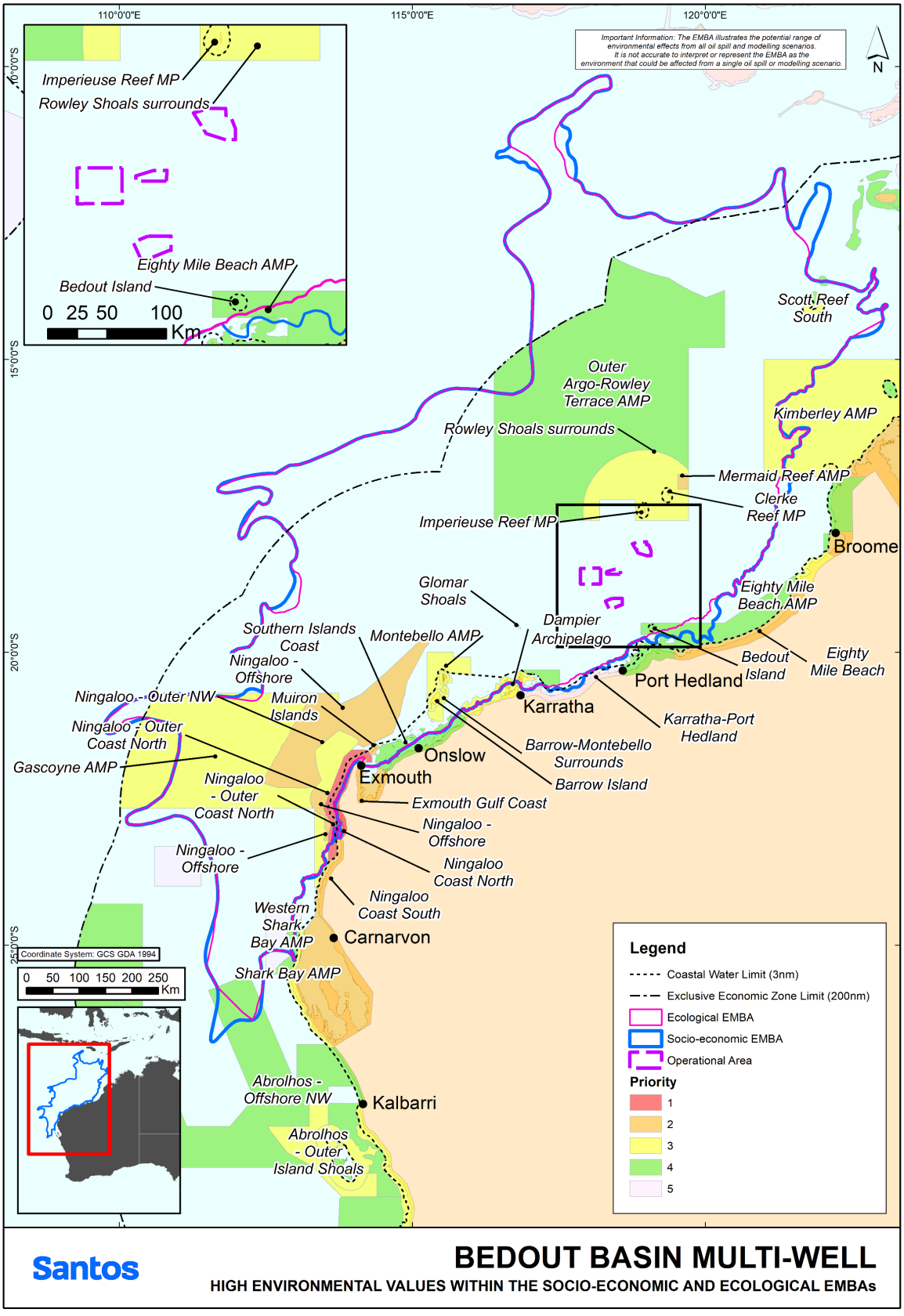



**Figure 7-7: HEV areas within the EMBA**

**Table 7-17: Physical and chemical pathways for hydrocarbon exposure and potential impacts to receptors**

| Receptor | Physical Pathway | Potential Impacts | Chemical Pathway | Potential Impacts |
|---|---|---|---|---|
| Rocky shorelines | Shoreline loading and attachment may result in thin and sporadic coating of hydrocarbon residues. Degree of oil coating is dependent upon the energy of the shoreline area, the type of the rock formation and continual biodegradation of the oil. | Impacts to flora (mangroves) and fauna further described below. | Chemical pathway to fauna and flora via adsorption through cellular membranes and soft tissue, ingestion, irritation/ burning on contact and inhalation. | Impacts to flora (mangroves) and fauna further described below. |
| Sandy beaches | Shoreline loading and water movement may allow hydrocarbon residue to filter down into sediments, continue to biodegrade on the surface or remobilise into surf zone. Degree of loading is dependent upon the energy and tidal reach of the shoreline, the type of the sandy shore and continual weathering of the oil. | Indirect impacts to nesting and foraging habitats for birds and turtles. Direct impacts to infauna. | Chemical pathway to fauna and flora via adsorption through cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation. | Indirect impacts to nesting and foraging habitats for birds and turtles. Direct impacts (mortality) to infauna through toxic effects and smothering. |
| Intertidal platforms | Shoreline loading and water movement may allow hydrocarbon residue to filter down into sediments (e.g. within wetlands) or continue to biodegrade on the surface or remobilise into surf zone. Degree of loading is dependent upon the energy and tidal reach of the shoreline, the type of the substrate and continual weathering of the oil. | Indirect impacts to foraging habitats for birds and turtles. Direct impacts to infauna. | Chemical pathway to fauna and flora via adsorption through cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation. | Indirect impacts to foraging habitats for birds. Direct impacts (mortality) to infauna through toxic effects and smothering. |
| Shallow sub-tidal soft sediments | Hydrocarbon residue in the shallow waters adjacent to shorelines may settle to filter down into sediments. Degree of loading is dependent upon the energy and tidal reach of the shoreline, the type of the substrate and continual weathering of the oil. | Indirect impacts to foraging habitats for turtles and fish. Direct impacts to infauna. | Adsorption via cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation. | Indirect impacts to foraging habitats for turtles and fish. Direct impacts (mortality) to infauna through toxic effects and smothering. |
| Mangroves | Coating of root system reducing air and salt exchange. Degree of coating is dependent upon the energy and tidal reach of the shoreline, the type of the substrate and continual weathering of the oil. | Yellowing of leaves.<br>Defoliation.<br>Increased sensitivity to stressors.<br>Tree death.<br>Reduced growth.<br>Reduced reproductive output.<br>Reduced seed viability. | External contact by oil and adsorption across cellular membranes. | Yellowing of leaves.<br>Defoliation.<br>Increased sensitivity to stressors.<br>Tree death.<br>Reduced growth.<br>Reduced reproductive output.<br>Reduced seed viability.<br>Growth abnormalities. |

| Receptor | Physical Pathway | Potential Impacts | Chemical Pathway | Potential Impacts |
|---|---|---|---|---|
| Seagrasses and macroalgae | Coating of leaves/thalli reducing light availability and gas exchange. Degree of coating depends upon the energy and tidal reach of the shoreline, the type of the receptor and continual weathering of the oil. | Bleaching or blackening of leaves.<br>Defoliation.<br>Reduced growth. | External contact by oil and adsorption across cellular membranes. | Mortality.<br>Bleaching or blackening of leaves.<br>Defoliation.<br>Disease. |
| Hard corals (coral reefs) | Coating of polyps, shading resulting in reduction on light availability. Degree of coating is dependent upon the metocean conditions, dilution, if corals are emergent at all and continual weathering of the oil. | Bleaching.<br>Increased mucous production.<br>Reduced growth. | External contact by oil and adsorption across cellular membranes. | Mortality.<br>Cell damage.<br>Reduced metabolic capacity.<br>Reduced immune response.<br>Disease.<br>Reduced growth.<br>Reduced reproductive output.<br>Reduced egg/larval success.<br>Growth abnormalities. |
| Non-coral benthic invertebrates | Coating of adults, eggs, and larvae.<br>Degree of coating is dependent upon the energy and tidal reach of the shoreline, the type of the receptor and continual weathering of the oil. | Mortality.<br>Behavioural disruption.<br>Impaired growth. | Ingestion and inhalation.<br>External contact and adsorption across exposed skin and cellular membranes.<br>Uptake of DAH across cellular membranes.<br>Reduced mobility and capacity for oxygen exchange. | Mortality.<br>Cell damage.<br>Reduced metabolic capacity.<br>Reduced immune response.<br>Disease.<br>Reduced growth.<br>Reduced reproductive output.<br>Reduced egg/larval success.<br>Growth abnormalities.<br>Behavioural disruption. |
| Sharks, rays, and fish | Coating of adults but primarily eggs and larvae – reduced mobility and capacity for oxygen exchange | Mortality.<br>Oxygen debt.<br>Starvation.<br>Dehydration.<br>Increased predation.<br>Behavioural disruption. | Ingestion.<br>External contact and adsorption across exposed skin and cellular membranes.<br>Uptake of DAH across cellular membranes (for example, gills). | Mortality.<br>Cell damage.<br>Flesh taint.<br>Reduced metabolic capacity.<br>Reduced immune response.<br>Disease.<br>Reduced growth.<br>Reduced reproductive output.<br>Reduced egg/larval success. |

| Receptor | Physical Pathway | Potential Impacts | Chemical Pathway | Potential Impacts |
|---|---|---|---|---|
| Birds (seabirds and shorebirds) | Degree of coating is dependent upon the energy and tidal reach of the shoreline, the type of the receptor and continual weathering of the oil. | Feather and skin irritation and damage, with the potential to cause secondary impacts such as:<br>• Physical restriction of flight and swimming movement.<br>• Mortality.<br>• Hypothermia / impairing the waterproofing of feathers.<br>• Disruption to feeding / starvation.<br>• Disruption to breeding.<br>• Disruption to migration. | Ingestion (during feeding or preening).<br>External contact and adsorption across exposed skin and membranes. | Mortality.<br>Cell damage, lesions.<br>Secondary infections.<br>Reduced metabolic capacity.<br>Reduced immune response.<br>Disease.<br>Reduced growth.<br>Reduced reproductive output.<br>Growth abnormalities.<br>Behavioural disruption. |
| Marine reptiles | Degree of coating is dependent upon the energy and tidal reach of the shoreline, the type of the receptor and continual weathering of the oil. | Irritation of eyes/mouth and potential illness, which may cause secondary impacts such as:<br>• Mortality.<br>• Disruption to feeding / starvation.<br>• Physical restriction.<br>• Behavioural disruption. | Inhalation.<br>Ingestion.<br>External contact and adsorption across exposed skin and membranes. | Mortality.<br>Cell damage, lesions.<br>Secondary infections.<br>Reduced metabolic capacity.<br>Reduced immune response.<br>Disease.<br>Reduced growth.<br>Reduced hatchling success.<br>Reduced reproductive output. |
| Marine mammals | Fur damage and matting, reduced mobility, and buoyancy (for applicable species). | Irritation of eyes/mouth, damage to fur and potential illness, which may cause secondary impacts such as:<br>• Mortality.<br>• Disruption to feeding / starvation.<br>• Physical restriction.<br>• Behavioural disruption. | Inhalation.<br>Ingestion.<br>External contact and adsorption across exposed skin and membranes. | Mortality.<br>Cell damage, lesions.<br>Secondary infections.<br>Reduced metabolic capacity.<br>Reduced immune response.<br>Disease.<br>Reduced growth.<br>Reduced reproductive output.<br>Growth abnormalities.<br>Behavioural disruption. |
| Plankton | Coating of feeding apparatus.<br>Reduced mobility and capacity for oxygen exchange. | Mortality.<br>Behavioural disruption (for example, reduced mobility). | Inhalation.<br>Ingestion.<br>External contact. | Mortality.<br>Impairment of biological activities (for example, feeding, respiration).<br>Reduced mobility. |

| Receptor | Physical Pathway | Potential Impacts | Chemical Pathway | Potential Impacts |
|---|---|---|---|---|
| Water quality and sediment quality | Presence of hydrocarbon residue in the water, which may filter down to sediments or continue to biodegrade on the surface.<br>Degree of loading in the water column is dependent upon the influence of wave energy and tidal range. | Impacts to flora and fauna, as discussed in rows above. | Adsorption via cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation.<br>Impacts to flora and fauna, as discussed in rows above. | Adsorption via cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation.<br>Impacts to flora and fauna, as discussed in rows above. |
| Protected areas | Coating of benthic habitats, shoreline habitats and marine fauna/flora within protected areas as discussed in rows above. | Mortality, injury, or behavioural disruption to marine fauna.<br>Death or impairment of habitats within protected areas.<br>Reduction in the quality of the marine environment within protected areas.<br>Environmental value of protected areas is degraded. | Impacts to flora and fauna, as discussed in rows above. | Mortality, injury, or behavioural disruption to marine fauna.<br>Death or impairment of habitats within protected areas.<br>Reduced growth of benthic habitats.<br>Reduction in the quality of the marine environment within protected areas.<br>Environmental value of protected areas is degraded. |
| Socio-economic environment (fisheries, tourism, shipping, defence, shipwrecks, Indigenous users, oil, and gas) | Presence of hydrocarbon residue in the water, which may filter down to sediments or continue to biodegrade on the surface.<br>Coating of benthic habitats, shoreline habitats and marine fauna/flora within protected areas as discussed in rows above. | Degradation of cultural or maritime heritage sites.<br>Disruption to tourism, recreation, or shipping activities.<br>Reduction in resource available for commercial and recreational fisheries.<br>EP stakeholder consultation (Section 4) did not raise any concerns regarding potential impacts to cultural features including sea country. However, Indigenous users and cultural features may be impacted in the event of an unplanned hydrocarbon release. | Impacts to flora, fauna and the physical environment as discussed in rows above.<br>Commercial/recreational fish species – refer to 'fish' as discussed above. | Degradation of cultural or maritime heritage sites.<br>Disruption to tourism, recreation, or shipping activities.<br>Reduction in resource available for commercial and recreational fisheries.<br>Socio-economic value of protected areas is degraded. |

**Table 7-18: Nature and scale of hydrocarbon spills on environment and socio-economic receptors within the EMBA**

| Receptor | Impacts of a hydrocarbon spill | |
|---|---|---|
| | Entrained and dissolved aromatic hydrocarbons | Floating hydrocarbons |
| **Fauna (Including Threatened/Migratory Fauna)** | | |
| Plankton (including zooplankton, fish, and coral larvae) | Direct exposure of plankton to hydrocarbons may result in lethal or sublethal impacts to plankton and impact mobility, feeding and respiration. Plankton could include the eggs and larvae of marine invertebrates and fish; therefore, entrained hydrocarbon could have secondary impacts on recruitment of invertebrate and fish species. Based on the modelling results (RPS, 2025) plankton will be exposed to hydrocarbons in the top 35 m of the water column, with the highest concentrations in the upper 10 m of the water column and areas close to the spill source.<br>Some studies have shown no obvious influence of hydrocarbon spills on plankton community structure (Varela et al., 2006), which could be a result of rapid replacement of stocks from adjacent areas due to water circulation (Batten et al., 1998). Other studies, however, have found the concentrations of phytoplankton reduced in the short term, and in the medium term, as outbreaks of algal blooms occurring where the Chlorophyll-a concentration increased (Lee et al., 2009; Sheng et al., 2011), particularly under warmer weather conditions (Tang et al., 2019) and in low energy environments such as coastal coves (Zhou et al., 2014).<br>Once water quality returns to background levels, it is anticipated plankton communities can return to normal densities and community structures due to their ability to produce large numbers of eggs and juveniles, their wide distribution, and rapid water exchange. | Plankton utilising the sea surface layer could be impacted by floating oil. |
| | There is the potential for hydrocarbons overlap with spawning of some fish species given the year-round spawning of some species. Some impacted spawn may be of commercial interest (refer socio-economic receptors below). The typical mass over-production of eggs and larvae that occurs in the lifecycle of most fish species provides a buffer for recruitment, which further reduces the likelihood that a spill would have a significant detectable impact on adult fish populations (ITOPF, 2014). | |
| Marine Mammals | There is potential for sublethal or lethal impacts to marine mammals and impacts to reproduction and behaviour from an accidental release of hydrocarbons. A wide range of effects from hydrocarbons have been reported in cetaceans including poor body condition, calcium imbalance, inflammation, reproductive failure, lung and adrenal gland damage, altered hepatobiliary function, immune changes and increased susceptibility to infections, impaired stress response, and death (Godard-Codding and Collier, 2018). | Marine mammals are at risk of direct contact with floating oil when surfacing within slick. Effects include irritation of eyes or mouth and potential illness. Surface respiration could lead to accidental inhalation of hydrocarbons or result in the coating of sensitive epidermal surfaces. Accidental ingestion could also occur through the ingestion of hydrocarbon during feeding or the ingestion of contaminated prey. Both Caley crude and MDO are expected to spread quickly when released and will form a thin to low thickness film on the sea surface, increasing the rate of evaporation (see Section 7.5.3) and limiting floating oils on the surface.<br>Inhalation of vapours or the ingestion of hydrocarbons can potentially have lethal effects due to damage to the whale's respiratory and nervous systems. |

| Receptor | Impacts of a hydrocarbon spill | |
|---|---|---|
| | **Entrained and dissolved aromatic hydrocarbons** | **Floating hydrocarbons** |
| | Marine mammals and the potential of them occurring within the EMBA are presented in Section 3.2.6. Of these, two are listed as endangered (blue whale and southern right whale) and two as vulnerable (sei whale, fin whale). The EMBA overlaps with the humpback whale, pygmy blue whale, southern right whale and dugong BIAs (see Table 3-10). Other migratory marine mammals may encounter either surface or water column hydrocarbons in the EMBA.<br>Dugongs are known to occur in coastal waters in the region, particularly in areas of seagrass within the EMBA (e.g. Barrow Island, Eighty Mile Beach, Ningaloo). Direct impacts to dugongs could occur through feeding or ingesting seagrass coated with hydrocarbon or through direct exposure to hydrocarbons. Dugongs could also be indirectly affected if hydrocarbons cause the dieback of seagrass, reducing feeding areas. | |
| Marine reptiles | There is potential for sublethal or lethal impacts to marine reptiles from an accidental release of hydrocarbons. Exposure can alter biochemical and haematological parameters, weight, skin function, metabolism, immune responses, diving patterns, and respiration (Ruberg et al., 2021).<br>The Recovery Plan for Marine Turtles in Australia: 2017–2027 (Commonwealth of Australia, 2017) highlights acute chemical discharge as one of several threats to marine turtles. | Marine turtles are at risk of direct contact with floating hydrocarbons when surfacing within slick. Effects include irritation of eyes or mouth and potential illness as adults can suffer mucus membrane inflammation, increasing susceptibility to infection (ITOPF, 2011).<br>Surface respiration could lead to accidental ingestion of hydrocarbons or result in the coating of sensitive epidermal surfaces. Breathing and inhalation of toxic vapours may occur from exposure to hydrocarbons in surface waters.<br>Physical coating of marine turtles also occurs upon contact of contaminated shorelines. Eggs may also become contaminated during laying, either from the laying female or the contaminated sand. |
| | Marine reptiles and the potential of them occurring within the EMBA are presented in Section 3.2.6. Loggerhead, green, leatherback, hawksbill and flatback turtles are widely dispersed across the NWS and in the unlikely event of a hydrocarbon spill occurring, individuals traversing open water may come into contact with water column or surface hydrocarbons.<br>The EMBA overlaps with various flatback turtle, green turtle, hawksbill turtle and loggerhead turtle BIAs and habitat critical for the survival (see Table 3-10). Potential impacts offshore would be greatest during the internesting season (between June and September for flatback turtles). Population level impacts are considered unlikely as the hydrocarbons are not predicted to contact the entire BIAs or areas of habitat critical to the survival of these species.<br>Modelling of a worst-case LOWC release predicts relatively low volumes of Caley crude accumulating on islands and mainland nesting beaches at concentrations >10 g/m$^2$ (see Section 7.6). Following a worst case release of MDO as a result of vessel collision, the probability of shoreline contact for Clerke Reef MP and Imperieuse Reef MP is 0.33% and 0.67% at ≥ 10 g/m². No shoreline accumulation is predicted at ≥ 100 g/m² and ≥ 1000 g/m² (see Section 7.7).<br>Any accumulated hydrocarbons interacting with the nesting beaches is likely to represent the persistent fraction in the form of viscous liquid and as tar balls as the hydrocarbon weathers. Adult and juvenile turtles during nesting seasons may become coated in the hydrocarbon as they move to and from shore and may also ingest hydrocarbons as they pass through the affected area.<br>Marine turtles rely on nesting beaches seasonally to reproduce, which makes them vulnerable to impacts from hydrocarbon accumulated on shorelines, through oiling of nesting females and emergent hatchlings (Lauritsen et al., 2017). Potential impacts would be greatest during the peak nesting periods.<br>Seasnakes may be found throughout the EMBA, particularly at shoals, banks and reefs. While little is known about their sensitivity to hydrocarbons, impacts from direct contact with surface hydrocarbons are likely to be similar to those experienced by marine turtles; for example, potential skin damage and irritation of mucous membranes of the eyes, nose and throat. | |
| Birds (seabirds and shorebirds) | There is potential for injury or mortality to seabirds and shorebirds and a change in their behaviour from an accidental release of hydrocarbons. Seabirds may encounter entrained hydrocarbons while diving and foraging. Seabirds and shorebirds encounter hydrocarbon contaminated materials when feeding at intertidal areas. Lethal or sub-lethal physical | Seabirds are particularly vulnerable to floating hydrocarbons. As most fish survive beneath floating slicks, they will continue to attract feeding seabirds, which typically do not exhibit avoidance behaviour. Smothering can lead to reduced water-proofing of feathers and ingestion while preening. In addition, direct contact with hydrocarbons can erode feathers, causing chemical damage |

| Receptor | Impacts of a hydrocarbon spill | |
|---|---|---|
| | **Entrained and dissolved aromatic hydrocarbons** | **Floating hydrocarbons** |
| | and toxic effects include those such as such as irritation of eyes or mouth and potential illness. | to the feather structure that subsequently affects ability to thermoregulate and maintain buoyancy on water.<br>Physical coating may also occur on contact of contaminated shorelines. |
| | Threatened or migratory species of seabirds and shorebirds and the potential of them occurring within the EMBA are presented in Section 3.2.6. The EMBA overlaps with various seabird BIAs for breeding and resting (see Table 3-10). Species may be impacted by surface hydrocarbons while foraging (dive and skim feeding) with higher numbers expected during the breeding periods.<br>From a LOWC in the Ara OA a maximum potential shoreline oil accumulation of 643 $m^3$ may occur on Imperieuse Reef and 506 $m^3$ on Clerke Reef MP. (see Section 7.6) (22% probability of receiving shoreline accumulation at >100 $g/m^2$ for Imperieuse Reef MP and 13% probability for Clerke Reef MP)) which covers a BIA for the little tern (resting) and white-tailed tropicbird (reproduction). The EMBA also overlaps a number of other BIAs for seabird extending from the mainland coast (Figure 3-18).<br>Birds (seabirds and shorebirds) are highly susceptible to hydrocarbon spills, with impacts primarily attributed to oiling of birds at the sea surface from slicks and oil on shorelines. Impacts to birds may include coating by oil when floating in open water, diving into open and coastal waters to feed on fish, wading and foraging on shallow intertidal mud/sand flats and wetlands or roosting on oil affected sandy beaches. Other impacts could include behavioural impacts whereby birds avoid important nesting and migratory stop-over areas including RAMSAR wetlands (e.g. Eighty Mile Beach) or reduced food availability if important foraging areas are impacted. For further information about environmental impacts to seabirds/shorebirds through hydrocarbon exposure and toxicity effects, see Table 7-17. | |
| Sharks, rays, and fish | There is potential injury or mortality to sharks, rays and fish and a change in their behaviour from an accidental release of hydrocarbons. As fish dwell in the water column, impacts are most likely from exposure to entrained or dissolved hydrocarbons, through the pathways of ingestion or the coating of gill structures, resulting in reduced oxygen exchange and incidence of irritation and infection. Fish may also ingest hydrocarbon droplets or contaminated food, leading to reduced growth.<br>There is potential for localised mortality of fish eggs and larva due to reduced water quality and toxicity. Based on the modelling results (RPS, 2025), fish eggs and larva will be exposed to hydrocarbons in the top 30 m of the water column, with the highest concentrations in the upper 10 m of the water column and areas close to the spill source. Demersal fish in deeper offshore waters are highly unlikely to be impacted by the hydrocarbon releases, as they generally inhabit waters near the seabed.<br>For further information about environmental impacts to fish/sharks/rays from hydrocarbon exposure and toxicity effects, see Table 7-18. | While fish, sharks and rays do not generally break the sea surface, individuals may feed at the surface. Prolonged exposure to floating hydrocarbons by fish, shark and ray species is unlikely.<br>Due to the filter-feeding nature of whale sharks, they may be susceptible to ingesting floating and entrained hydrocarbons, particularly if foraging at or near the sea surface. |
| | Threatened or migratory species of sharks, rays, and fish and the potential of them occurring within the EMBA are presented in Section 3.2.6. A whale shark feeding BIA overlaps the EMBA and OAs (see Table 3-10). The closest high-density whale shark feeding BIA off the Ningaloo coast is >500 km away from the OAs, but within the EMBA. The whale shark may particularly off the Ningaloo coastline between March and June and is known to feed in surface waters. Only in the event of a LOWC is entrained oil at the 1,000 ppb threshold predicted to extend to this location. There is the potential for the species to ingest oil from surface slicks with resultant damage to gills, other tissues and organs. For further information about environmental impacts to fish/sharks/rays from hydrocarbon exposure and toxicity effects, see Table 7-15. | |

| Receptor | Impacts of a hydrocarbon spill | |
|---|---|---|
| | Entrained and dissolved aromatic hydrocarbons | Floating hydrocarbons |
| **Socio-economic** | | |
| Commercial, recreational and traditional fisheries | Hydrocarbons in the water column can have toxic effects on fish (as outlined above) potentially reducing catch rates and rendering fish unsafe for human consumption.<br>Impacts on spawning fish can also result in impacts to commercial fisheries. | In addition to the effects of entrained and DAHs, exclusion zones surrounding a spill can directly impact fisheries by restricting access for fishermen. Weathered slicks may form tar balls which may result in oiling of nets and fishing infrastructure. |
| | A number of commonwealth and state fisheries may operate within the EMBA (Section 3.2.7.3). Impacts to these fisheries from a spill may range from disruption of fishing activities caused by the physical presence of the slick, loss of (or loss of function of) coastal intertidal habitat (for example, seagrass meadows, mangrove communities, intertidal mudflats) which may provide nursery habitat for fishery species (for example, fish and crustaceans) and contact of surface and entrained hydrocarbons with the eggs and larvae of commercially important species.<br>Exposure to entrained and dissolved oils could result in the accumulation of hydrocarbon in fish tissues to the extent that could result in hydrocarbon taint of fish flesh. Connell and Miller (1981a, 1981b) compiled a summary of studies listing the exposure value concentrations at which tainting occurred for hydrocarbons. The results contained in their review indicate tainting of fish occurs when they are exposed to ambient concentrations of 4–300 ppm (4,000–300,000 ppb) of hydrocarbons in the water, for durations of 24 hours or more, with response to phenols and naphthenic acids being the strongest. Given entrained hydrocarbons are predicted to exceed the moderate exposure value at some locations hydrocarbon taint is possible in fish flesh. Although it is difficult to assess how long fish might be exposed for, small, less mobile fishes would be more susceptible. It is possible impacts could be detected to fisheries on a stock level, although it is more likely natural variation in fish abundance would be on a greater scale than any impacts attributable to a hydrocarbon spill. This would most likely be the case for fisheries species that use shallow waters around the banks and shoals and could occur through direct impacts to fish or to fish habitats (for example, seagrass, coral reef, mangrove habitats). In general, fish are not expected to retain a taint for longer than a week after exposure to entrained or dissolved hydrocarbons (Gagnon & Holdway, 2000, cited in Westera & Babcock, 2016).<br>The same negative impacts could also occur to important traditional Indonesian and recreational fish target species.<br>Commercial, recreational and traditional fisheries may be impacted within the EMBA due to wider implications of taint on fish species. | |
| Recreation and tourism | There is the potential for surface hydrocarbon to temporarily disrupt tourism activities which rely on the presence of marine fauna and/or the use of vessels (e.g. snorkelling/scuba diving, whale/whale shark watching/swimming and recreational fishing) via displacement from an exclusion zone or a reduction in fauna abundance due to avoidance of the area.<br>A number of areas with high diversity or which have unique ecological values are protected within AMPs. As well as reducing the visual amenity of these areas, a LOWC spill could impact the habitats and marine fauna of these areas thereby impacting the environmental values of these tourism areas.<br>Impacts to recreational fishing may also occur due to impacts to fish as described for fisheries above.<br>Given the water depths and distance from the nearest mainland, impacts to recreational and tourism related activities are unlikely. | |
| Shipping | Commercial shipping is known to overlap or occur in close proximity to the OAs and within the EMBA (Figure 3-26). Hydrocarbons in the water column will have no effect on shipping. Exclusion zones surrounding a spill will reduce access for shipping vessels for the duration of the response undertaken for spill clean-up (if applicable). Ships may have to chart alternative routes, leading to potential delays and increased costs. | |
| Defence | The EMBA does overlap some of the Defence Training Area (RAAF Base Learmonth) (Figure 3-27). Interference of defence activities due to a hydrocarbon spill is expected to be minimal. | |
| Shipwrecks | There are a number of historic (>75 years old) shipwrecks within the EMBA. Shipwrecks may be of important heritage value and/or act as dive sites. Surface hydrocarbons will have no impact on shipwrecks. Hydrocarbons in the water column either as entrained oil or DAHs may extend thousands of kilometres from the release location. The potential for in-water hydrocarbons to impact on shipwrecks is poorly documented. However, it has been proposed that exposure to oil may alter bacterial community composition (biofilms) inhabiting shipwrecks possibly altering corrosion potential (Salerno et al., 2018). | |

| Receptor | Impacts of a hydrocarbon spill | |
|---|---|---|
| | Entrained and dissolved aromatic hydrocarbons | Floating hydrocarbons |
| Indigenous users | Marine resource use by Indigenous people is generally restricted to coastal waters. Fishing, hunting and the maintenance of maritime cultures and heritage through ritual, stories and traditional knowledge continue as important uses of the nearshore region and adjacent areas. While the EMBA is largely offshore, it may overlap with cultural features (Section 3.2.7.1). Impacts to these features from a spill include, but are not limited to, a disruption/displacement of cultural activities caused by the physical presence of hydrocarbon, decline in traditional food sources and / or mortality of fauna with cultural significance e.g. totemic species. | |
| Existing oil and gas activity | A number of oil and gas operators operate within the EMBA which encompasses the entire NWS with existing projects and infrastructure in place as well as continuing drilling and exploration programs. A surface slick has the potential to disrupt activity potentially halting production or exploration with associated economic impact. Exclusion zones surrounding spills will reduce access potentially resulting in delays to work schedules with possible subsequent financial implications. | |
| **Protected areas** | | |
| Marine parks and commonwealth heritage areas | Protected areas are identified in Sections 3.2.5.1 and 3.2.5.2<br>These protected areas support all the habitats and faunal groups described above and support unique/protected habitats/marine fauna or ecological features. Impacts to the habitat/fauna receptors described above therefore have an impact on the values of these reserves which could have flow-on effects to tourism revenue for coastal communities that provide access to these marine reserves. The protected areas may also support nursery/feeding/aggregation areas for fisheries species and therefore may assist in maintaining healthy fish stocks and commercial/recreational fisheries. | |
| RAMSAR wetlands | Eighty Mile Beach RAMSAR wetlands is located within the EMBA (~150 km from Mestrel/Bancroft OA). Eighty Mile Beach is important environments for migratory shorebirds which have been described above. | |
| KEFs | KEFs overlapping EMBA are identified in Section 3.2.5.3.<br>While some features associated with the KEFs are subtidal or submerged and would not be directly contacted by a surface slick, they all may support increased productivity or abundance of marine fauna that use surface waters above the features (including plankton, pelagic invertebrates and fish, marine mammals, marine reptiles, and seabirds) which may be impacted by floating oil. Impacts to these marine faunae are described above. | |
| Threatened ecological communities | No threatened ecological communities are located within the EMBA. | |

### 7.5.6 Spill Response Strategies

Numerous spill response strategies are available to be implemented in the event of a spill. These are generally strategies that have been implemented in the past or are considered good industry practice. Section 6 of the OPEP provides a detailed description of the applicable response strategies for this activity, which include, depending on the type and size of the spill:

- source control
- monitor and evaluate
- mechanical dispersion
- containment and recovery
- surface and subsea dispersant
- protection and deflection
- shoreline clean up
- oiled wildlife response
- operational and scientific monitoring.

## 7.6 Hydrocarbon Spill: Loss of Well Control

### 7.6.1 Description of Event

This chapter describes the worst-case hydrocarbon spill from a loss of well control (LOWC).

The likelihood of LOWC as described in the chapter below is considered 'remote'. This was based on a past global occurrence frequency of 1.5 x10-4 per well, (or stated more simply, approximately 1 event per 6,667 wells drilled) (IOGP, 2019). It should be noted that a LOWC event of this magnitude has a less than 0.02% chance of occurring.

| | |
|---|---|
| **Event** | A loss of well control during drilling may occur due to a number of reasons including:<br>• loss of primary and secondary well control.<br>In the event of a LOWC, crude and associated gas may be released to the marine environment with the most likely release points at either the MODU floor or seabed.<br>Worst-case credible spill scenarios were estimated to cover the possibility of a LOWC event from any well drilled under this EP. The worst-case credible spill scenarios were predicted by selecting the most likely hydrocarbon flow parameters from the well to yield the credible maximum LOWC volumes and rates (i.e. environmentally credible worst-case volume and rate) from both subsurface (seabed) and surface (MODU floor) unplanned releases. Key parameters for input to this 'worst-case' LOWC event were taken from key Santos well design documents and Well Design Automation System, suitable analogues, latest reservoir models, or Santos best estimates where information was unavailable.<br>Quantitative hydrocarbon spill modelling was undertaken for the worst-case subsurface and surface spill scenarios. The LOWC worst-case discharge volumes that were used for the hydrocarbon spill modelling were based on *Santos' Bedout Drilling EP Worst Case Discharge Technical File Note. Rev 2, March 2025* (Santos Doc No. 7735-375-WLP-0002). Outputs from the modelling were used to inform the environmental impact assessment and to assist with emergency planning.<br>The environmental consequences of a LOWC are highly variable, dependent on the characteristics of the hydrocarbon released, the dynamics of the receiving environment and the proximity of the release point to sensitive environmental receptors. |
| **Extent** | The EMBA for the worst-case hydrocarbon spill from a LOWC was defined in Section 3.1. For information on the extent of potential impact associated with a LOWC, see Section 7.6.1.1. |
| **Duration** | The worst-case duration of a LOWC is predicted as 77 days (refer to the OPEP). This is the estimated time required to drill a relief well and gain control of the primary well barrier. Hydrocarbons will persist within the environment for a longer period of time, although the hydrocarbon released is expected to weather quickly through evaporation and dispersion. |

#### 7.6.1.1 Stochastic Spill Modelling-Summary of Results for Moderate Exposure Thresholds

The spill modelling results for the loss of well control is summarised in Table 7-19.

**Table 7-19: Summary of results (Stochastic Modelling)**

| | OAs | | |
|---|---|---|---|
| | **Ara** | **Mestrel/Bancroft** | **Curie** |
| Floating oil exposure | • Floating oil concentrations ≥1 g/m² could extend up to 934 km from the release site, reducing to 286 km and 150 km at 10 g/m² and 50 g/m² thresholds.<br>• The highest probabilities of exposure are forecasted as follows:<br>– 50.66% for concentrations ≥1 g/m² in the Rowley Shoals surrounds.<br>– 14.67% for concentrations ≥10 g/m² in the same area. · Rowley Shoals surrounds is the only receptor with recorded exposure at 50 g/m², with a probability of 5.33%. · Quickest oil exposure at 1 g/m² threshold.<br>• The shortest time to floating oil exposure at the 1 g/m² threshold is expected at Rowley Shoals, occurring 35 hours (~1.45 days) after the spill begins. | • Floating oil concentrations ≥1 g/m² could extend up to 1,049 km from the release, reducing to 497 km at 10 g/m² and 165 km at 50 g/m².<br>• Highest probabilities of exposure are as follows:<br>– 13.00% for concentrations ≥1 g/m² at Glomar Shoals followed by Montebello AMP (11.33%) and Montebello Islands (10.33%)<br>– At ≥10 g/m² and 50 g/m², there is no contact for Glomar Shoals and Montebello Islands.<br>– For Montebello Islands AMP, at ≥10 g/m², the probability is 0.33%.<br>• Floating oil exposure at the 1 g/m² threshold is predicted to reach Glomar Shoals in 166 hours (~6.92 days) after the spill starts. | • Concentrations of hydrocarbons ≥1 g/m² could extend up to 673 km from the release location, decreasing to 210 km at 10 g/m² and 184 km at 50 g/m².<br>• The highest probabilities of exposure are forecasted as follows:<br>– 12.33% for concentrations ≥1 g/m² in the Rowley Shoals surrounds.<br>– 3.00% for concentrations ≥10 g/m² in the same area.<br>• Rowley Shoals was the only EVA with recorded exposure at 50 g/m², showing a probability of 0.33%.<br>• The shortest time to floating oil exposure at the 1 g/m² threshold is expected at Rowley Shoals, occurring 60 hours (~2.5 days) after the spill begins. |
| Shoreline accumulation | • The highest probability of shoreline oil accumulation at 10 g/m² is forecast for Imperieuse Reef MP (34.00%) and Clerke Reef MP (18.33%), with the shortest times for accumulation being 77 hours (~3.21 days) for Imperieuse Reef MP and 94 hours (~3.92 days) for Clerke Reef MP.<br>• The highest probability of shoreline oil accumulation at 100 g/m² is forecast for Imperieuse Reef MP (22.33%) and Clerke Reef MP (13.33%), with the shortest times for accumulation being 113 hours (~3.21 days) for Imperieuse Reef MP and 115 hours (~3.92 days) for Clerke Reef MP.<br>• The maximum oil volumes recorded are 643 m³ at Imperieuse Reef MP and 506 m³ at Clerke Reef MP.<br>• The maximum shoreline lengths affected from a single spill are 19 km at 10 g/m² and 100 g/m² for Imperieuse Reef MP | • The highest probability of shoreline oil accumulation at or above 10 g/m² was forecast for the Montebello Islands (8.33%) and Southern Islands Coast (4.00%). This reduced to 3.00% and 1.00% respectively at the 100 g/m² threshold, with the shortest times for accumulation being 407 hours (~17 days) for Southern Islands Coast and 353 hours (~15 days) for Montebello Islands.<br>• Shoreline oil accumulation for Dampier Archipelago was predicted at 302 hours (~12.58 days) for the ≥10 g/m² threshold.<br>• Maximum oil accumulation was forecast at 7 m³ for the Southern Islands Coast.<br>• The maximum shoreline lengths affected from a single spill are 12 km at 10 g/m² and 2 km at 100 g/m² for Montebello Islands and 10 km and 2 km for Southern Islands coast. | • The highest probability of shoreline oil accumulation at or above the 10 g/m² threshold is forecasted for Imperieuse Reef Marine Park (MP) at 19.00%, followed by Clerke Reef MP at 10.67%.<br>• The probabilities of oil accumulation along the shorelines of Imperieuse Reef MP and Clerke Reef MP decrease to 4.67% and 2.00%, respectively, as the threshold increases to 100 g/m².<br>• Imperieuse Reef MP is expected to experience the quickest shoreline oil accumulation exceeding the 10 g/m² threshold, occurring at 123 hours (~5.13 days) after the spill and 213 hours (~8.5 days) at 100 g/m².<br>• The maximum shoreline lengths affected from a single spill are 11 km at 10 g/m² and 100 g/m² for Imperieuse Reef MP and 7 km and 3 km for Clerke Reef MP. |

| | OAs | | |
|---|---|---|---|
| | **Ara** | **Mestrel/Bancroft** | **Curie** |
| | and 11 km and 8 km for Clerke Reef MP respectively. | | |
| Entrained hydrocarbons | • The highest probability of exposure is 54.99%, with the highest recorded concentration of 13,117 ppb and a minimum time before contact of 36 hours, all occurring around the Rowley Shoal surrounds at ≥ 1,000 ppb. | • Glomar Shoals has the highest probability of exposure at 53.33%, with the maximum recorded concentration reaching 11,773 ppb and a minimum exposure time of 176 hours (~7.33 days) at threshold ≥1,000 ppb followed by Ningaloo offshore with a probability of 31.66% and exposure time of 327 hours (~13.6 days).<br>• The highest predicted concentration, 14,077 ppb, is at Ningaloo – Offshore, with a minimum time of 327 hours (~14 days) before exposure at ≥ 1,000 ppb. | • The highest probability of exposure is forecasted at Imperieuse Reef Marine Park (MP) at 13.33%, with the highest recorded concentration of 4,454 ppb and a minimum exposure time of 162 hours (~7 days) at threshold ≥1,000 ppb.<br>• Rowley Shoals surrounds are expected to experience the highest hydrocarbon concentration of 5,186 ppb, with a minimum exposure time of 194 hours (~8 days).<br>• Ningaloo Coast North is forecasted to experience the quickest exposure, occurring just 76 hours (~6.75 days) after the spill begins. |
| Dissolved hydrocarbons | • The highest probability of exposure (61.66%) for concentrations above 10 ppb occurs around the Rowley Shoal Surrounds. The probability decreases to 49.33% and 26.33% at ≥50 ppb and ≥400 ppb respectively.<br>• The highest predicted concentration is 5,660 ppb at Rowley Shoal Surrounds, with a minimum time before exposure of 32 hours (~1.5 days), 39 hours (~1.6 days) and 46 hours (2 days) at the 10 ppb, 50 ppb and 400 ppb thresholds respectively. | • The highest probability of exposure (64.99%) at or above 10 ppb occurs at Glomar Shoals. The probability decreases to 45% and 4.67% at≥50 ppb and ≥400 ppb respectively.<br>• The highest predicted concentration is 2,528 ppb at Ningaloo – Offshore with a minimum time before exposure of 270 hours (~11 days) at the 10 ppb threshold.<br>• The minimum time before exposure at the 10 ppb threshold is 80 hours (~3.33 days), 81 hours (3.3 days) at 50 ppb and 96 hours (~4 days) at 400 ppb at Glomar Shoals respectively. | • The highest probability of exposure at or above the 10 ppb threshold is forecasted for Ningaloo – Offshore, with a rate of 42.66%. The probability decreases to 11.33% and 0.33% at≥50 ppb and ≥400 ppb respectively.<br>• The highest concentration of hydrocarbons, at 1,769 ppb, is predicted for Rowley Shoals surrounds, which is also expected to record the quickest exposure time at the 10 ppb threshold, occurring in 56 hours (~ 2.33 days). The exposure at 50 ppb and 400 ppb is 86 hours (~3.5 days) and 155 hours (~6.4 days) respectively. |

### 7.6.2 Nature and Scale of Environmental Impacts

Hydrocarbon spills will cause a decline in water quality and may cause chemical (e.g. toxic) and physical (e.g. coating of emergent habitats, oiling of wildlife at sea surface) impacts to marine species. The severity of the impact of a hydrocarbon spill depends on the magnitude of the spill (i.e. extent, duration) and sensitivity of the receptor.

The magnitude of potential environmental impact from a hydrocarbon release depends on multiple factors including hydrocarbon type, release volume and rate, and ocean and weather conditions.

An assessment of the sensitive environmental receptors at risk from a hydrocarbon release has been determined based on a literature review and trajectory and fate modelling described above. Section 3.2 includes a description of the biological environment present in the OAs and/ EMBA.

Table 7-18 presents the nature and scale of environmental impact of a hydrocarbon spill on environment and socio-economic receptors within the EMBA. Potential receptors are further summarised below.

**Potential receptors:**

- *Physical environment (water quality):* a hydrocarbon release will cause a decline in water quality and may cause impacts to marine species. Physical environments include coral reef and benthic habitats, mangroves, seagrasses, macroalgae and sandy beaches.
- *Threatened or migratory fauna* (marine mammals, marine reptiles, sharks, fish, rays and birds): the EMBA contains important rookery, foraging and nesting for loggerhead, green, flatback and hawksbill turtles, nesting and migratory habitat for seabirds, and whale migration, feeding and reproduction. Marine fauna may be impacted by a spill through exposure to floating oil, entrained oil, or dissolved aromatic hydrocarbons.
- *Protected and significant areas* (KEFs, Marine Parks): As described in Section 3 the EMBA intersects several marine parks which contain designated key ecological features, supporting areas of high biodiversity with enhanced productivity and feeding and breeding aggregation.
- *Socio-economic receptors* (fisheries, tourism, recreation, and other third-party operators): The EMBA intersects areas used for recreational fishing, charter boat tourism and nature-based tourism.
- *Cultural receptors and sea country* – cultural heritage values are present within the EMBA.

The potential impact pathways (physical and chemical) of hydrocarbon exposure to relevant habitat and marine fauna receptors are summarised in Table 7-17 and an impact assessment completed for receptors within the EMBA is presented in Table 7-18.

### 7.6.3 Net Environmental Benefit Analysis

Net environmental benefit analysis (NEBA) is a structured approach used by the response community and stakeholders to select spill response strategies that will effectively remove oil, are feasible to use safely in particular conditions, and will reduce the impact of an oil spill on the environment.

The NEBA process is used during pre-spill planning (strategic NEBA) and during a response (operational NEBA). A strategic NEBA is an integral part of the contingency planning process and is used to ensure response strategies for scenarios are well informed. An operational NEBA is used to ensure evolving conditions are understood, so response strategies can be adjusted as necessary to manage individual response actions and end points.

Balancing trade-offs may involve differing and conflicting priorities, values, and perceptions of the importance of sensitive receptors. There is no universally accepted way to assign perceived value or importance, and it is not a quantitative process. Overall, the NEBA process provides an estimate of potential environmental effects that are sufficient to allow the parties to compare and select preferred combinations of response strategies to reduce environmental impacts to ALARP.

A strategic NEBA has been developed for all response strategies identified as applicable to credible spills identified in the OPEP related to an unplanned release of condensate, with the potential environmental benefit or potential impact to each protection priority area. This will provide information that will help to select response strategies tailored to the key environmental values within the areas of highest priority. A summary of spill response strategies is available for each of the priorities for protection and the potential impact that a response strategy has on the area's environmental values.

This information is to be considered in the NEBA process that takes place during a spill response (i.e. an operational NEBA). An operational NEBA will also consider real-time monitoring of the effectiveness and potential impacts of a response and will also consider accessibility, feasibility, and safety of responders (see Section 6 of the OPEP).

### 7.6.4 Environmental Impact Assessment

The below environmental impact assessment follows the risk assessment approach detailed in Section 7.5.5

#### 7.6.4.1 Identification of Hotspots for Consequence Assessment

As described in Section 7.5.5, all HEVs within the EMBA for the three LOWC scenarios identified in Section 7.5.1.1 are listed in Table 7-20. The values and sensitivities associated with these HEVs have been described in Section 3 and Appendix C. Additionally, Table 7-20 filters the HEV to identify the hotspots where they meet the criteria.

**Table 7-20: Hotspot Analysis for LOWC scenarios**

| Receptor | HEV Ranking | Hotspot | Hotspot Selection Rationale |
|---|---|---|---|
| Abrolhos – Offshore NW | 4 | N | HEV=4, very low probability (0.33%) of dissolved hydrocarbons ≥10 ppb only. |
| Barrow-Montebello Surrounds | 3 | Y | HEV=3<br>>5% probability for dissolved oil ≥10 ppb |
| Barrow Island | 3 | Y | HEV=3<br>>5% probability for dissolved oil ≥10 ppb |
| Bedout Island | 4 | Y | Low HEV ranking of 4<br>>5% probability for dissolved oil ≥10 ppb<br>Significant turtle nesting habitat. |
| Brewis Reef | 5 | N | Low HEV ranking of 5 |
| Clerke Reef MP | 3 | Y | HEV=3 with probabilities >5% for floating oil (≥10 g/m$^2$), shoreline accumulation (≥100 g/m$^2$) and dissolved oil (≥10 ppb). |
| Cod Bank | 5 | N | Low HEV ranking of 5 |
| Dampier AMP | 4 | N | Low HEV ranking of 4. |
| Dampier Archipelago | 3 | Y | >5% probability for dissolved oil ≥10 ppb |
| Eighty Mile Beach AMP | 4 | N | Low HEV ranking of 4. |
| Exmouth Gulf Coast | 2 | N | <5% probability for dissolved oil (≥10 ppb) and floating oil (≥10 g/m$^2$). No shoreline accumulation. |
| Exmouth Reef | 5 | N | Low HEV ranking of 5 |
| Gascoyne AMP | 3 | Y | >5% probability for dissolved oil ≥10 ppb |
| Glomar Shoals | 5 | N | Low HEV ranking of 5. |
| Imperieuse Reef MP | 3 | Y | HEV=3 and with probabilities >5% for floating oil (≥10 g/m$^2$), shoreline accumulation (≥ 100 g/m$^2$) and dissolved oil (≥10 ppb). |
| Karratha-Port Hedland | 5 | N | Low HEV ranking of 5.<br>Floating oil: ≥1 g/m² at 1% probability for Karratha–Port Hedland (min. time to contact is predicted as 15 days). There is no shoreline accumulation predicted at thresholds of 10 g/m$^2$ |
| Kimberley AMP | 3 | N | <5% probability for dissolved oil (≥10 ppb) and floating oil (≥10 g/m$^2$). |
| Lowendal Islands | 3 | Y | >5% probability for dissolved oil ≥10 ppb |
| Madeleine Shoals | 4 | N | Low HEV ranking of 4. |
| Mermaid Reef AMP | 2 | Y | HEV=2<br>>5% probability for dissolved oil ≥10 ppb |
| Middle Islands Coast | 4 | N | Low HEV ranking of 4.<br><5% probability for dissolved oil (≥10 ppb). No probability of floating oil (≥10 g/m$^2$) or shoreline accumulation (≥100 g/m$^2$). |

| Receptor | HEV Ranking | Hotspot | Hotspot Selection Rationale |
|---|---|---|---|
| Montebello AMP | 3 | Y | HEV=3<br>>5% probability for dissolved oil ≥10 ppb |
| Montebello Islands | 3 | Y | HEV=3<br>>5% probability for dissolved oil ≥10 ppb<br>3% probability for shoreline accumulation ≥100 g/m$^2$. |
| Muiron Islands | 2 | Y | HEV=2<br>>5% probability for dissolved oil ≥10 ppb |
| Ningaloo – Offshore | 2 | Y | HEV=2<br>>5% probability for dissolved oil ≥10 ppb |
| Ningaloo – Outer Coast North | 1 | Y | HEV=1<br>>5% probability for dissolved oil ≥10 ppb |
| Ningaloo – Outer NW | 3 | Y | HEV=3<br>>5% probability for dissolved oil ≥10 ppb |
| Ningaloo Coast North | 1 | Y | HEV=1<br>>5% probability for dissolved oil ≥10 ppb |
| Northern Islands Coast | 3 | N | < 5% probability for dissolved oil (≥10 ppb), floating oil (≥10 g/m$^2$) and shoreline accumulation (≥ 100 g/m$^2$). |
| Outer Argo-Rowley Terrace AMP | 4 | N | Low HEV ranking of 4. |
| Penguin Bank | 5 | N | Low HEV ranking of 5. |
| Poivre Reef | 5 | N | Low HEV ranking of 5. |
| Port Hedland-Eighty Mile Beach | 4 | N | Low HEV ranking of 4.<br><5% probability for floating oil (≥10 g/m$^2$) and shoreline accumulation (≥ 100 g/m$^2$). |
| Rankin Bank | 5 | | Low HEV ranking of 5. |
| Ripple Shoals | 5 | N | Low HEV ranking of 5. |
| Rosily Shoals | 5 | N | Low HEV ranking of 5. |
| Rowley Shoals surrounds | 3 | Y | HEV=3<br>>5% probability for dissolved oil ≥10 ppb and floating oil ≥10 g/m$^2$. |
| Scott Reef South | 3 | N | <5% probability for floating oil (≥10 g/m$^2$) and shoreline accumulation (≥100 g/m$^2$). |
| Shark Bay AMP | 4 | N | Low HEV ranking of 4. |
| Southern Islands Coast | 4 | N | Low HEV ranking of 4. |
| Sultan Reef | 5 | N | Low HEV ranking of 5. |
| Thevenard Islands | 4 | N | Low HEV ranking of 4. |
| Trap Reef | 5 | N | Low HEV ranking of 5. |
| Western Shark Bay AMP | 5 | N | Low HEV ranking of 5. |

Based on the assessment, the following have been identified as hotspots:

- Barrow-Montebello Surrounds
- Barrow Island
- Bedout Island
- Clerke Reef MP
- Dampier Archipelago

- Gascoyne AMP
- Imperieuse Reef MP
- Lowendal Islands
- Mermaid Reef AMP
- Montebello AMP
- Montebello Islands
- Muiron Islands
- Ningaloo-Offshore
- Ningaloo-Outer Coast North
- Ningaloo Outer NW
- Ningaloo Coast North
- Rowley Shoals Surrounds.

A summary of hydrocarbon modelling results is provided in Appendix H. Appendix H2 provides detailed consequence assessment results for each of the hot spot areas. A summary of this consequence assessment is presented in Table 7-21.

### 7.6.4.2 Exposure duration

French-McCay (2025) summarised experimental evidence that acute lethal concentrations of total PAHs (LC50s) generally range from 10–300 ppb. For offshore and open coastal water oil spills, where short-term exposures are expected, an acute threshold of 10 ppb total PAH was recommended.

In applying the 10-ppb total PAH threshold, Santos interrogated the oil spill model to analyse the exposure durations. across the EMBA for the lowest 'dissolved' threshold (10 ppb) for each OA (Appendix H4).

The figures in Appendix H4 represent the geographical extents (boundaries) of the maximum continuous residence time of dissolved hydrocarbons at or above 10 ppb for a LOWC unplanned event at Curie, Ara and Mestrel/Bancroft. Each EMBA figure is an amalgamation of 300 spill simulations with different metocean conditions.

During each oil spill simulation, the model calculates the oil concentration in every grid cell over time. At the end of each simulation, it determines the maximum continuous period that the oil concentration remains above a specified threshold in each cell. For example, if the dissolved hydrocarbon concentration in one cell stays above 10 ppb for 6 continuous hours, then the Maximum Continuous Residence Time for that cell is 6 hours. This calculation is performed across all 300 simulations, with the highest value for each cell presented in the final results as time intervals of 1–2, 3–6, etc.). See Figure 7-8 for an illustration of this.

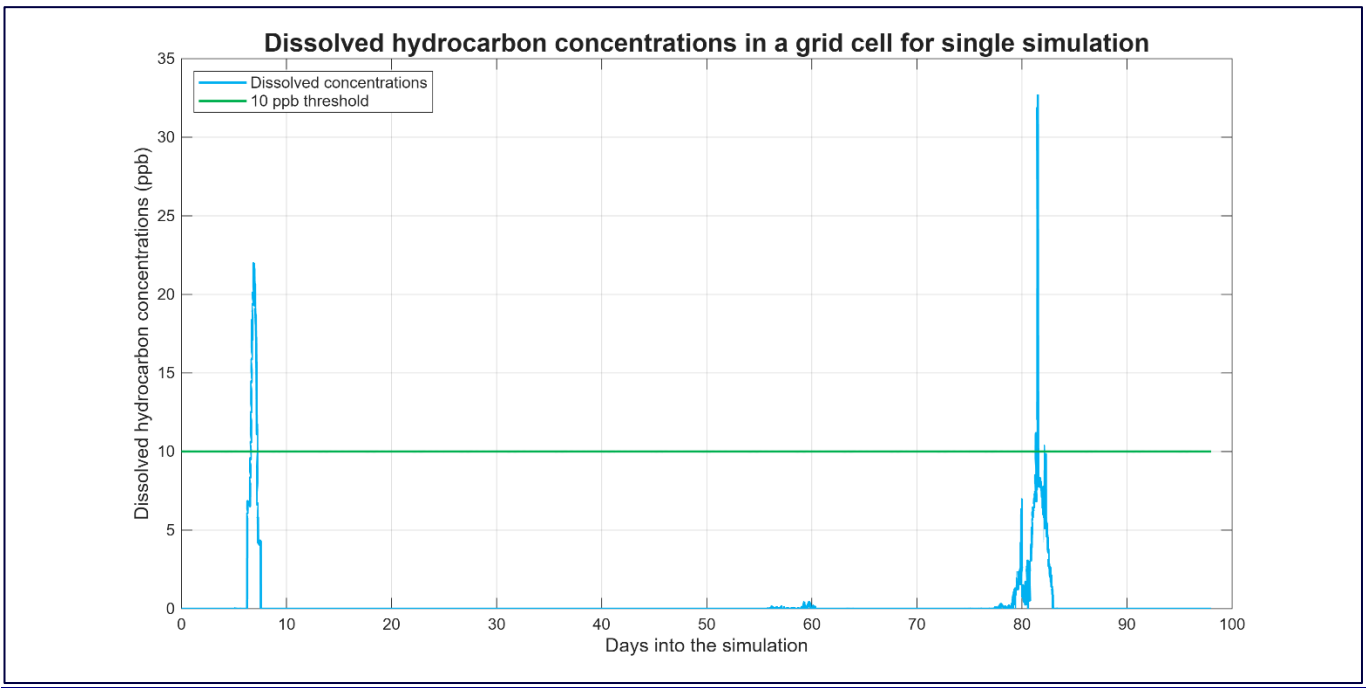



**Figure 7-8: Difference in cumulative vs continuous exposure**

The figure shows the exposures observed at a particular grid cell over the LOWC release duration of 77 days and beyond. Assuming some marine species are present in that grid cell, the figure illustrates how the species are not receiving exposures at or above 10 ppb continuously.

Appendix H4 contains figures for each OA, illustrating that the majority of the EMBA in each LOWC scenario has a maximum continuous residence time (dissolved oil at or above 10 ppb) of <12 hours, with the following percentages modelled for under 6 hours:

- Ara – 79% of the EMBA experiences a maximum continuous residence time under 6 hours
- Curie – 89% of EMBA experiences a maximum continuous residence time under 6 hours
- Bancroft – 83% of the EMBA experiences a maximum continuous residence time under 6 hours.

Based on these modelled exposure durations/residence times, >79% of the EMBA would experience short duration exposures. A summary of the impacts of continuous exposure are presented in Table 7-21.

In addition to the maximum continuous residence time, Santos also modelled the cumulative exposure to dissolved hydrocarbons (10 ppb) over a 77-day LOWC event. The outcome of this modelling shows a cumulative exposure duration of <48 hours (over 77 days) across the majority of the EMBA. Although the cumulative duration presents an overly conservative approach, it does not take into consideration the contact time for species which are mobile (e.g. cetaceans), and therefore able to move away from a hydrocarbon release. Figure 7-8 demonstrates the difference between Continuous vs Cumulative exposure duration.

Based on a review done by French-McCay (2025), LC50s and other toxicity endpoints vary considerably with exposure duration over the range of several hours to several days (Sprague, 1969; Abel, 1980; Mancini, 1983; Bailey et al., 1985; McAuliffe 1987; McCarty et al. 1992a, b). According to French-McCay, animals can be unaffected by short-duration exposures to concentrations that could affect them if exposed for days or weeks. Organisms can recover from sublethal exposures, by elimination of toxins from tissues (French-McCay 2025). Based on this, Santos considers that receptors that may be contacted at or above the 10 ppb dissolved threshold on a cumulative basis are more likely to be able recover from sublethal exposures within the repeated contact timeframes and has therefore chosen to use the maximum continuous residence time to represent the worst case for use in the impact assessment.

**Table 7-21: Impact, likelihood and consequence ranking – loss of well control**

| Description | |
|---|---|
| **Receptors** | • physical environment (water quality) and benthic habitat<br>• threatened or migratory fauna (marine mammals, marine reptiles, sharks, fish, rays and birds)<br>• protected and significant areas (KEFs, WHAs, Marine Parks)<br>• socio-economic receptors (fisheries, tourism, recreation, and other third-party operators)<br>• cultural receptors and sea country. |
| **Consequence** | IV-Major |
| The detailed consequence assessment for each hotspot is provided in Appendix G.<br>**Physical environment and benthic habitat –** *Subtidal /submerged features (e.g. Plankton (including zooplankton, fish, and coral larvae)).*<br>The worst-case consequence assessment for physical environment at any identified hotspot was Major (IV) at Clerke Reef MP, Imperieuse Reef MP and Rowley Shoal Surrounds (Appendix G).<br>Rowley Shoals Surrounds had the highest probability (54.99%) of exposure to entrained hydrocarbons at or above 1,000 ppb, with a maximum continuous residence time 45 hours for dissolved (10 ppb). However, it should be noted that the probability of a loss of well control (LOWC) incident occurring that may affect the Rowley Shoals environment is estimated to be low, 0.02% chance of occurring (1.5 x 10-4 per well).<br>In the highly unlikely event of a LOWC subsea or surface, hydrocarbons will likely reach a range of marine habitats above ecological impact thresholds. Hydrocarbons that reach nearshore environments have the potential to impact benthic coral reefs and mangrove areas, which may result in a long-term decrease in ecological values given toxicity impacts associated with hydrocarbon exposure.<br>Direct exposure of plankton to hydrocarbons (with sufficient exposure duration) may result in lethal or sublethal impacts to plankton and impact mobility, feeding and respiration. Plankton could include the eggs and larvae of marine invertebrates and fish; therefore, entrained hydrocarbon could have secondary impacts on recruitment of invertebrate and fish species. Based on the modelling results (RPS, 2025) plankton will be exposed to hydrocarbons in the top 35 m of the water column, with the highest concentrations in the upper 10 m of the water column and areas close to the spill source.<br>Some studies have shown no obvious influence of hydrocarbon spills on plankton community structure (Varela et al., 2006), which could be a result of rapid replacement of stocks from adjacent areas due to water circulation (Batten et al., 1998). Other studies, however, have found the concentrations of phytoplankton reduced in the short term, and in the medium term, as outbreaks of algal blooms occurring where the Chlorophyll-a concentration increased (Lee et al., 2009; Sheng et al., 2011), particularly under warmer weather conditions (Tang et al., 2019) and in low energy environments such as coastal coves (Zhou et al., 2014). | |

| Description |
| --- |
| Once water quality returns to background levels, it is anticipated plankton communities can return to normal densities and community structures due to their ability to produce large numbers of eggs and juveniles, their wide distribution, and rapid water exchange.<br><br>**Threatened or Migratory Fauna**<br>In the highly unlikely event of a LOWC, the volume of hydrocarbon released would result in a reduction in water quality with the potential to impact marine fauna. Marine fauna present in the area may be impacted by a spill through exposure to floating oil, entrained oil, or dissolved aromatic hydrocarbons. A description of impacts to marine fauna from exposure to hydrocarbons is provided in Table 7-17.<br>The EMBA overlaps a migration BIA of humpback whale, migration BIA and feeding BIA of pygmy blue whale, migration BIA and reproduction BIA of southern right whale, feeding BIA of whale sharks, feeding BIA of dugongs, and a number of seabird BIAs and marine turtle BIAs. There is potential for behavioural disruption to the local population as individuals traverse the area affected. The effects of a LOWC release would be greatest within a few kilometres of the spill, where the concentration of toxic aromatic hydrocarbons is highest, and the hydrocarbon layer is thickest on the water's surface. Once in the marine environment, the condensate's toxicity will diminish rapidly over time, thinning on the surface due to evaporation or dispersing into the water column.<br>Habitat modification, degradation, disruption, or loss, deteriorating water quality and marine pollution are identified as potential threats to a number of marine fauna species in relevant recovery plans and conservation advice (Table 3-11). With controls in place that align with relevant actions described in various recovery plans, the activity will be conducted in a manner that reduces potential impacts to ALARP and an acceptable level.<br><br>*Marine Mammals*<br>There is potential for sublethal or lethal impacts to marine mammals and impacts to reproduction and behaviour from an accidental release of hydrocarbons. A wide range of effects from hydrocarbons have been reported in cetaceans including poor body condition, calcium imbalance, inflammation, reproductive failure, lung and adrenal gland damage, altered hepatobiliary function, immune changes and increased susceptibility to infections, impaired stress response, and death (Godard-Codding and Collier, 2018). Marine mammals are at risk of direct contact with floating when surfacing within slick. Effects include irritation of eyes or mouth and potential illness. Surface respiration could lead to accidental inhalation of hydrocarbons or result in the coating of sensitive epidermal surfaces. Accidental ingestion could also occur through the ingestion of hydrocarbon during feeding or the ingestion of contaminated prey. Both Caley crude and MDO are expected to spread quickly when released and will form a thin to low thickness film on the sea surface, increasing the rate of evaporation (see Section 7.5.3) and limiting floating oils on the surface.<br>Inhalation of vapours or the ingestion of hydrocarbons can potentially have lethal effects due to damage to the whale's respiratory and nervous systems.<br>Marine mammals and the potential of them occurring within the EMBA are presented in Section 3.2.6. Of these, two are listed as endangered (blue whale and southern right whale) and two as vulnerable (sei whale, fin whale). The EMBA overlaps with the humpback whale, pygmy blue whale, southern right whale and dugong BIAs (see Table 3-9). Other migratory marine mammals may encounter either surface or water column hydrocarbons in the EMBA.<br>Dugongs are known to occur in coastal waters in the region, particularly in areas of seagrass within the EMBA (e.g. Barrow Island, Eighty Mile Beach, Ningaloo). Direct impacts to dugongs could occur through feeding or ingesting seagrass coated with hydrocarbon or through direct exposure to hydrocarbons. Dugongs could also be indirectly affected if hydrocarbons cause the dieback of seagrass, reducing feeding areas.<br>Based on results of continuous residence time modelling, the majority of the impacted area would experience <6 hours continuous exposure (at 10 ppb dissolved), with concentrations occurring for the longest duration, closest to the spill. Given mobility of these species to move away from an event, impacts to individuals are unlikely to impact species at a population level.<br><br>*Reptiles*<br>Marine reptiles and the potential of them occurring within the EMBA are presented in Section 3.2.6. Loggerhead, green, leatherback, hawksbill and flatback turtles are widely dispersed across the NWS and in the unlikely event of a hydrocarbon spill occurring, individuals traversing open water may come into contact with water column or surface hydrocarbons.<br>The EMBA overlaps with various flatback turtle, green turtle, hawksbill turtle and loggerhead turtle BIAs and habitat critical for the survival (see Table 3-9). Potential impacts offshore would be greatest during the internesting season (between June and September for flatback turtles). Population level impacts are considered unlikely as the hydrocarbons are not predicted to contact the entire BIAs or areas of habitat critical to the survival of these species.<br>Marine turtles rely on nesting beaches seasonally to reproduce, which makes them vulnerable to impacts from hydrocarbon accumulated on shorelines, through oiling of nesting females and emergent hatchlings (Lauritsen et al., 2017). Potential impacts would be greatest during the peak nesting periods.<br>Seasnakes may be found throughout the EMBA, particularly at shoals, banks and reefs. While little is known about their sensitivity to hydrocarbons, impacts from direct contact with surface hydrocarbons are likely to be similar to those experienced by marine turtles; for example, potential skin damage and irritation of mucous membranes of the eyes, nose and throat.<br>Modelling of a worst-case LOWC release predicts relatively low volumes of Caley crude accumulating on islands and mainland nesting beaches at concentrations >10 g/m$^2$ (see Section 7.6). |

| Description |
| --- |
| Any accumulated hydrocarbons interacting with the nesting beaches is likely to represent the persistent fraction in the form of viscous liquid and as tar balls as the hydrocarbon weathers. Adult and juvenile turtles during nesting seasons may become coated in the hydrocarbon as they move to and from shore and may also ingest hydrocarbons as they pass through the affected area.<br>Impacts to individuals are unlikely to impact species at a population level.<br><br>*Fishes including sharks and rays*<br>Threatened or migratory species of sharks, rays, and fish and the potential of them occurring within the EMBA are presented in Section 3.2.6. A whale shark feeding BIA overlaps the EMBA and OAs (see Table 3-10). The closest high-density whale shark feeding BIA off the Ningaloo coast is >500 km away from the OAs, but within the EMBA. The whale shark may particularly off the Ningaloo coastline between March and June and is known to feed in surface waters. Only in the event of a LOWC is entrained oil at the 1,000-ppb threshold predicted to extend to this location. For further information about environmental impacts to fish/sharks/rays from hydrocarbon exposure and toxicity effects, see Table 7-15.<br><br>**Protected areas**<br>The EMBA intersects several State protected areas, AMPs, World Heritage Areas, and marine management areas (Section 3.2.5). Combined, these areas support all the habitats and faunal groups described above. Impacts to the habitat/fauna receptors described above therefore have an impact on the values of these reserves which could have flow-on effects to tourism revenue of coastal communities that provide access to these marine reserves.<br>The protected areas may also support nursery/feeding/aggregation areas for fisheries species and therefore may assist in maintaining healthy fish stocks and commercial/recreational fisheries.<br>Eighty Mile Beach RAMSAR wetlands is located within the EMBA (~150 km from Mestrel/Bancroft OA). Eighty Mile Beach is an important environment for migratory shorebirds which have been described above.<br>The maximum continuous residence time for dissolved hydrocarbons (10 ppb) at Eight Mile Beach AMP has been modelled at 8 hours.<br>KEFs overlapping the EMBA are identified in Section 3.2.5.3. While some features associated with the KEFs are subtidal or submerged and would not be directly contacted by a surface slick, they all may support increased productivity or abundance of marine fauna that use surface waters above the features (including plankton, pelagic invertebrates and fish, marine mammals, marine reptiles, and seabirds) which may be impacted by floating oil. Impacts to these marine faunae are described above.<br>No threatened ecological communities are located within the EMBA.<br><br>**Socio-economic receptors**<br>There is the potential for surface oil to temporarily disrupt fishing activities if the surface oil moves through fishing areas. Entrained oil at or above 1,000 ppb could reach the fisheries and impact them. Fisheries contacted by floating oil at or above the low threshold (1 g/m$^2$) may be temporarily closed, which would have an impact on fishermen through loss of income. Market value/ demand for fish may also be impacted due to actual or perceived tainting of catches. The significance of any decrease in market value/demand for fish may be substantial to those few individual fisheries operating in the affected areas, but it is unlikely to cause any significant long-term impact. Fisheries within the EMBA are as listed in Table 3-12.<br>The oil spill modelling reported shoreline accumulation at Clerke Reef, Imperieuse Reef, Lowendal Islands, Montebello Islands and Dampier Archipelago at or above 10 g/m$^2$.<br>Tourism could be affected by spilled condensate, either from reduced water quality or shoreline oiling preventing recreational activities, reducing aesthetic appeal or from impacts to habitats and marine fauna as described in Table 7-17.<br>There are oil and gas operators operating within the EMBA with existing projects and infrastructure in place as well as continuing drilling and exploration programs. A LOWC in the OAs has the potential to disrupt these activities, with associated economic impact, albeit on a temporary basis.<br><br>**Cultural heritage and Features**<br>Marine resource use by Indigenous people is generally restricted to coastal waters. Fishing, hunting and the maintenance of maritime cultures and heritage through ritual, stories and traditional knowledge continue as important uses of the nearshore region and adjacent areas. While the EMBA is largely offshore, it may overlap with cultural features (Section 3.2.7.1). Impacts to these features from a LOWC include, but are not limited to, a disruption/displacement of cultural activities caused by the physical presence of hydrocarbon, decline in traditional food sources and / or mortality of fauna with cultural significance e.g. totemic species.<br>During EP stakeholder consultation, Ngarluma Aboriginal Corporation and Kariyarra Aboriginal Corporation requested they be notified in the event of a spill that may contact their area of interest. This has been included in the notifications table (Table 8-6).<br><br>**Cumulative Impacts**<br>An unplanned LOWC event is not intended to occur during the activity with the controls in place. If a LOWC did coincide with planned or unplanned activities from Santos or other operators in the vicinity of the OA, they will be discrete events and any impacts will be expected to be limited to the extent of the EMBA. The likelihood of multiple unplanned events with significant environmental consequence occurring in the same vicinity and concurrently is not considered to be a credible risk given |

| Description | |
|---|---|
| industry standards and control measures typically implemented. As such, Santos has reasonably assessed unplanned events would result in negligible potential for cumulative impacts.<br>On the basis of the above assessment, a LOWC has the potential to impact an array of receptors. Given the extent and the presence of protected areas within the EMBA, the worst-case consequence is considered to be Major (IV). | |
| **Likelihood** | a-Remote |
| In accordance with the Santos Risk Matrix, a worst-case surface release of hydrocarbon as a result of LOWC has been defined as an 'Remote' event as it 'requires exceptional circumstances and is unlikely even in the long-term'.<br>The likelihood of a LOWC event occurring is based on industry statistics, Santos' statistics, and the standard preventive control measures in place. Wells are designed with essential engineering and safety control measures to prevent a loss of containment occurring. For Offshore Operations of North Sea Standard, the frequency of a LOWC for an exploration well was found to be $1.5 \times 10^{-4}$ per well year. This frequency is based on two LOWC events during exploration drilling in the UK between 1980 and 2014 (IOGP 2019).<br>Management controls in place to control the flow of hydrocarbons include construction design and regular inspection and maintenance. Additional industry-standard and activity-specific control measures to reduce the chance of a loss of containment event have also been implemented including (but not limited to) procedures such as a NOPSEMA accepted WOMP, safety case, and a spill response plan (OPEP). These control measures are considered to reduce the risk of a loss of containment (and minimise impacts) occurring to a level that is acceptable.<br>In accordance with the Santos Risk Matrix, given the control measures in place, the likelihood of worst-case seabed release of hydrocarbon as a result of LOWC resulting in a Moderate (III) consequence is considered to be Remote. | |
| **Residual Risk** | Low |

### 7.6.5 Environmental Performance Outcomes and Control Measures

The EPOs relating to this hazard include:

- No loss of containment of hydrocarbon to the marine environment [BB-EPO-10]
- No unplanned objects, emissions or discharges to sea or air [BB-EPO-06]
- No injury or mortality to EPBC Act and BC Act listed marine fauna during activities [BB-EPO-05]

The control measures considered for this event are shown in Table 7-22 and EPS and, measurement criteria for the EPOs are described in Table 8-2.

**Table 7-22: Control measure evaluation for hydrocarbon spill-LOWC**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-54 | Drilling and completions management process | Administrative | Includes control measures for well integrity and well control in an accepted WOMP, MODU Safety Case.<br>Defines critical acceptance criteria for well operations that reduce the risk of a LOWC.<br>Accounts for emergency situations such as cyclone response plan | Costs associated with preparing and implementing the WOMP, Safety Case and drilling and completions (D&C) programs. | **Adopted**<br>Regulatory requirement, must be adopted. |
| BB-CM-51 | MODU and support vessel spill response plans including predrilling source control plan | Administrative | Implements response plan to deal with an unplanned hydrocarbon spill quickly and efficiently in order to reduce impacts to the marine environment. | Personnel cost and administrative costs associated with preparing documents, ongoing management (spill response exercises) and implementation of plans. | **Adopted**<br>Benefits considered to outweigh negligible costs to Santos. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| BB-CM-55 | Accepted OPEP | Administrative | Implements response plans to deal with an unplanned hydrocarbon release quickly and efficiently in order to reduce impacts to the marine environment. | Administrative costs of preparing documents and large costs of preparing for and implementing response strategies. | **Adopted** Regulatory requirement must be adopted. |
| BB-CM-11 | Marine assurance standard | Administrative | Ensures contracted vessels are operated, maintained and manned in accordance with industry standards and regulatory requirements (this EP) and the relevant Santos procedures mentioned in this EP. | No additional cost. | **Adopted** Benefits considered to outweigh negligible costs to Santos. |
| BB-CM-24 | MODU planned maintenance system (PMS) | Administrative | MODU equipment is operating within its parameters, reducing the risk of unplanned discharges to the marine environment | Costs are standard for routine PMS. | **Adopted** Benefits considered to outweigh negligible costs to Santos. |
| BB-CM-56 | Pre-campaign commencement assurance check | Administrative | Ensures consideration of worst-case hydrocarbon spill scenario for the proposed activity based on actual MODU, vessel and activity details. | Administrative costs to undertake assurance check and risk assessments for each campaign | **Adopted** Benefits considered to outweigh negligible costs to Santos. |
| BB-CM-57 | Predrilling source control plan | Administrative | Implements response plans to deal with an unplanned hydrocarbon release quickly and efficiently in order to reduce impacts to the marine environment. | Administrative costs of preparing documents and large costs of preparing for and implementing response strategies. | **Adopted** Regulatory requirement must be adopted |
| BB-CM-58 | External validation of pore pressure modelling | Engineering | Independent assessment of pore pressure model to ensure that internal work is robust and covers the full range of credible options. This allows the well design and fluid density to cover the full range of potential pressure outcomes and mitigate the likelihood of a well control event to ALARP. | Cost for external consultant to review | **Adopted:** Benefits considered to outweigh negligible costs to Santos. |
| BB-CM-59 | Well control bridging document | Administrative | Agreement between Santos and Rig Contractor on most appropriate and typically most stringent standard to apply in relation to well control practices, prevention and responses ensures well control risk likelihood and consequence is minimised to ALARP. | Administrative costs of preparing documents | **Adopted**: Benefits considered to outweigh negligible costs to Santos |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| BB-CM-60 | Well control certification | Administrative | Relevant personnel hold appropriate well control certification to prevent, detect and respond to well control situations ensures well control risk likelihood and consequence is minimised to ALARP. | Cost / time to train personnel | **Adopted:** Benefits considered to outweigh negligible costs to Santos |
| **Additional Control Measures** | | | | | |
| BB-CM-61 | Only one MODU will drill into the reservoir at any one time | Administrative | Eliminate the risk of loss of well containment events occurring concurrently**.** | Schedule impact/cost to delay. | **Adopted:** Environmental benefit outweighs risk/cost to schedule in the event of a LOWC. |
| BB-CM-62 | Where independent SME ad/or technical authority validation of pore pressure modelling identifies material discrepancies or uncertainties, Real time pore pressure monitoring will be implemented. | Engineering | Reduction in the potential severity of a loss of well containment event, potential reduction in the number of causes of a loss of well containment event, reduction in the likelihood of inadequate operational practices exacerbating a loss of well containment event. | Real time pore pressure monitoring is up to USD $5k/d, or USD$150k | **Adopted:** Appropriate to implement real time pore pressure monitoring where independent SME and/or technical authority validation of pore pressure modelling identifies discrepancies or uncertainties to mitigate likelihood to ALARP. |
| N/A | Manage the timing of the activity to avoid sensitive periods (e.g. spawning, whale and whale shark migration, bird and turtle nesting) | Eliminate | Reduce risk of impacts from highly unlikely LOWC during environmentally sensitive periods for listed marine fauna (e.g. spawning, whale and whale shark migration, bird and turtles nesting). | High cost in moving or delaying activity schedule. Would double duration of activity; increase impacts or potential impacts in other areas including increase in waste, air emissions, risk of vessel collisions etc. The risk to all listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable presence of some species. | **Not adopted** Given the minimal risk of impacts to listed marine species (e.g. turtles) occurring, the financial and environmental costs of extending activity duration deemed grossly disproportionate to low environmental benefits. |
| N/A | Positioning a second MODU on standby | Engineering | Potentially reduce relief well drilling time by shortening time for MODU mobilisation | Whilst positioning a second MODU on standby would reduce the mobilisation time, | **Not adopted** The environmental, safety and campaign costs |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | other critical path activities are performed during this period, such as relief well planning and expediting of regulatory approvals, Therefore, the 77 day period to complete a relief well is not expected to be materially reduced by having a MODU on standby. This would double the campaign cost and add safety and environmental risks associated with additional vessels and equipment. | are considered grossly disproportionate to the environmental benefit (a minor potential reduction to stop the LOWC, particularly considering the remote likelihood of a LOWC event and the existing preventative control measures in place to prevent a LOWC).<br>Deemed unnecessary given the robust suite of preventive and response controls already in place. |
| N/A | Temporarily move AMOSC subsea first response toolkit (SFRT) to Dampier to reduce SFRT mobilisation time during the activity | Engineering | Provides an improvement in mobilisation time, as the 4-5 day move from Jandakot to Dampier will be eliminated. | Temporarily moving the SFRT equipment to Dampier is not feasible, as the equipment is a shared resource with other Titleholders who are members of the AMOSC SFRT service and moving this equipment away from the Jandakot location limits the travel capability of the equipment for other titleholders. | **Not adopted**<br>The SFRT is shared resource with a specified storage and maintenance location. Moving the equipment to an alternative location limits the travel capability (i.e. away from Perth airport) and also introduces maintenance risks. |

### 7.6.6 Demonstration of as Low as Reasonably Practicable

Drilling activities offshore is a well-practised nationally and internationally activity. The application of industry-standard safe drilling practices including a well design that incorporates intrinsic safety features and primary well control mechanisms, such as maintaining the proper hydrostatic pressure via a monitored fluid column, alongside secondary controls like blowout preventers significantly lowers the probability of a containment loss. Standard control measures (Table 7-22) are in place to manage the risk to ALARP. These include implementation of Santo's *Drilling and Completions Management Process* which integrates well integrity criteria into the well design, a MODU safety case and an accepted WOMP. MODU and vessel PMS ensure that the equipment is operated within safe parameters, further reducing the likelihood of LOWC.

Well control bridging documents are in place to ensure agreement between Santos and the rig contractor on the most appropriate and stringent standard to apply, further minimising well control risk to ALARP. In addition, pore pressure modelling will be assured by an Independent Subject Matter Expert (SME) and/or Technical Authority to confirm internal work is robust and covers the full range of credible options, allowing the well design and fluid

density to address the full range of potential pressure outcomes. Additionally, all relevant personnel will hold appropriate well control certification to ensure capability to prevent, detect and respond to well control situations, further reducing the likelihood and consequence of a LOWC to ALARP. Where external validation of pore pressure modelling identifies discrepancies or uncertainties, real-time pore pressure monitoring will be implemented to reduce the likelihood of a LOWC.

Stochastic spill modelling conducted by Santos has identified appropriate source control measures to limit the spill volume in the event of a LOWC incident to ALARP. Further details are provided below.

Source control and detection controls:

- the drilling of a relief well is considered the primary means of controlling the source in the event of an unplanned well release. Spill response and impact assessment for this activity has been based on the relief well taking 77 days (11 weeks) to execute. A breakdown of the key tasks and their timeframe to drill a relief well in 11 weeks have been included in Sections 9.2.1 and 9.2.2 of the OPEP.

Supporting controls to allow the relief well schedule to be met include:

- Assurance Review 4: 'Readiness to Spud' checklist is conducted under the Drilling & Completions Management Process (DCMP).
- rig capability register is maintained.
- a well-specific Source Control Plan (SCP) is prepared in accordance with *the Santos Source Control Planning and Response Guidelines*. The SCP contains information and considerations for relief well operations including but not limited to:
  - relief well surface locations (primary and secondary)
  - relief well trajectory and interception target point
  - dynamic well kill modelling calculations for controlling a worst-case discharge (e.g. kill mud weight, kill pump rate/pressure and kill mud volume required)
  - status of relief well tangible equipment.
  - Australian Petroleum Production and Exploration Association (APPEA) Memorandum of Understanding (MoU) provides for access to other Operator rigs.
  - contracts and MoUs for 3rd party independent well control specialist personnel are in place.

A second MODU positioned on standby in the vicinity of the activity during the drilling activity was considered as an additional control that could reduce the length of time taken to drill a relief well. This would involve hiring an additional rig for the duration of the activity. If adopted, this may reduce the timeframe for stopping a LOWC by up to two weeks, although planning/approval/set-up requirements mean the reduction would likely be less. The cost of having a MODU and personnel/equipment on standby would double the cost of the activity and introduce additional safety and environmental risks due to presence of an additional MODU and support vessels/equipment being on standby. This is considered grossly disproportionate to the environmental benefit (a potential reduction of two weeks to stop the LOWC, particularly considering the likelihood of a LOWC and the existing preventative control measures in place to prevent a LOWC). Having a dedicated second MODU on standby for the purpose of relief well drilling was therefore not adopted as a control measure.

In order to minimise lead times, a rig with a NOPSEMA approved Safety Case will be preferred. These rigs are tracked on the Rig Capability Register and access is covered under the APPEA MoU. For the water depths at this location, it is possible that a semi-submersible MODU may be feasible to drill the relief well instead of a jack-up, but this would also depend on the exact circumstances of the LOWC scenario and therefore feasibility is not guaranteed. The well specific Source Control Plan will assess the feasibility and availability of suitable MODUs prior to each drilling activity occurring.

Direct intervention (i.e. deployment onto the MODU) using specialised well control personnel is a strategy that could be adopted and supported through contractual arrangements with well control vendors. This strategy is contingent on technical aspects of the LOWC event and safety considerations which could only be assessed at the time of a spill event. For this reason, the current preparedness measures for well intervention experts is considered ALARP.

Santos has access to a SFRT including dispersant and deployment personnel through contract to AMOSC and Oceaneering respectively. Santos also has access to a capping stack, technical expertise and deployment personnel through contract to WWCI.

In the event the SFRT was required, SFRT equipment can be mobilised to Dampier from Jandakot in 4-5 days, under existing arrangements. Locating this equipment in Dampier could potentially reduce deployment time, by 4-5 days providing a suitable vessel was on standby for immediate mobilisation. However, the equipment is a shared resource across AMOSC SFRT subscription members so relocating it for a drilling campaign is not considered

viable. Providing a vessel on standby for SFRT deployment could reduce deployment time but given SFRT deployment may not be suitable or feasible, a potential reduction in deployment time due to a vessel being on standby is not seen to offer sufficient environmental benefit, particularly given this is not expected to reduce the 15-day timeline for readiness of deployment of the capping stack.

In the event that the capping stack was required, it can be mobilised from Singapore in 15 days with an additional system available in Aberdeen. Locating the capping stack in Australia was considered; however, the equipment is a shared global resource across WWCI subscription members so relocating for a drilling campaign is not viable. Feasibility of capping stack deployment is linked to a variety of factors, including the following:

- extent of the blowout and ability to safely access the well
- water depth
- damage to an individual well that may have occurred during the LOWC event

Although up to two MODUs may operate concurrently in sperate OAs, only one MODU will drill into the reservoir at any one time. Therefore, it is not possible for two simultaneous LOWC events to occur.

Additional control measures (Table 7-22) were evaluated but not adopted where they were determined to be grossly disproportionate to the potential benefit or not technically feasible. For example, positioning a second MODU on standby was considered to potentially reduce relief well drilling time by up to two weeks; however, this would double the campaign cost and add safety and environmental risks associated with additional vessels and equipment, and was deemed unnecessary given the robust suite of preventive and response controls already in place. Similarly, rescheduling the activity to avoid sensitive biological periods (e.g. marine turtle nesting, whale and whale shark migration) was not adopted, as the presence of fauna is unpredictable, the operational area lies outside critical habitats, and extending the activity duration would increase emissions, discharges, and interaction risks with other marine users.

Direct well intervention using contracted well control specialists remains a viable, case-specific control strategy, supported by pre-arranged contractual access. Its implementation would depend on the technical specifics of a LOWC event and is considered ALARP given the preparedness arrangements already in place. Santos considers that through the selection of appropriate spill response strategies, development of spill response controls and maintenance of preparedness arrangements and resources to implement these controls, spill risk is mitigated to ALARP. Preparedness spill response controls are outlined in Section 6.8 while those that would be implemented in the event of a spill are outlined within the OPEP.

### 7.6.7 Acceptability Evaluation

| | |
|---|---|
| **Is the risk ranked between Very Low to Medium?** | Yes-residual risk is ranked low |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with *Santos' Environmental Hazard Identification and Assessment Procedure*, which considers principles of ESD.<br>The residual risk for this aspect is Low and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – management consistent with OPGGS(E)R 2023 Regulations, including safety case and WOMP.<br>Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-11. |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | During the public comment period, comments were raised regarding LOWC probability and response time. Santos has addressed these comments and provided further clarification on these matters in Section 7.6.6,<br>Santos will notify First Nations people in the event of a spill, as requested during consultation (Table 8-6). |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

The probability of a LOWC event occurring during the activity is low when factoring in industry data, Santos' own statistics, and the preventative controls in place. Wells are engineered with essential safety and engineering

controls to prevent a LOWC incident. Additionally, industry-standard and activity-specific measures have been applied to further reduce the likelihood of such an event and minimise potential impacts. These measures include procedures such as the safety case, WOMP, personnel training and awareness, and a spill response plan (OPEP). According to Santos' risk assessment, the residual risk is considered ALARP (As Low As Reasonably Practicable). The control measures proposed are expected to reduce the risk of impacts from a LOWC to an acceptable level.

# 7.7 Hydrocarbon Spill: Marine Diesel Oil

## 7.7.1 Description of Event

| | |
|---|---|
| **Event** | **Worst credible MDO spill**<br>It is considered credible that a vessel collision could occur between the support vessels, between a support vessel and the MODU, or between a passing third party vessel and the MODU or a support vessel. The worst-case environmental incident resulting from a vessel collision is the rupturing of the largest primary installation vessel MDO fuel tank resulting in the release of MDO to the environment. Vessel collisions could occur due to factors such as human error, poor navigation, vessel equipment failure or poor weather. This scenario would result in a spill of diesel at the sea surface.<br>The AMSA (2015) *Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities* recommend that the spill scenario for modelling and impact assessment should be based on the largest single unprotected fuel tank volume. The largest MDO fuel tank capacity was 325 $m^3$.<br>For the purpose of the EP the impacts of a MDO spill of 325 $m^3$ has been assessed as this is the largest credible MDO spill associated with the activity.<br>**Refuelling Incident**<br>The second most significant MDO spill scenario identified is a primary vessel refuelling incident (fuel hose failure or rupture, coupling failure or tank overfilling) where fuel bunkering would need to be stopped manually. Fuel released prior to the cessation of pumping as well as fuel remaining in the transfer line may escape to the environment.<br>The AMSA (2015) *Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities* provides guidance for calculating a maximum credible spill volume for a refuelling spill. The guidance provided by AMSA (2015) for a refuelling spill under continuous supervision is considered appropriate, given refuelling will be constantly supervised. The maximum credible spill volume during refuelling is calculated as: transfer rate (150 $m^3$/hr) × 15 minutes of flow giving a volume of 37.5 $m^3$. The detection time of 15 minutes is seen as conservative but applicable following failure of multiple barriers followed by manual detection and isolation of the fuel supply. |
| **Extent** | Diesel spill trajectory modelling (GHD 2021) indicated that there was some probability of a 325 $m^3$ MDO spill extending as follows (using the moderate exposure thresholds) based on a summary from the modelling locations:<br>• shoreline loading was predicted to occur within 45 km.<br>• surface oil was predicted to occur within ~38 km.<br>• total submerged oil was predicted to occur within ~41 km.<br>• dissolved hydrocarbons were predicted to occur within ~47 km. |
| **Duration** | A 325 $m^3$ release of MDO was modelled for a release over 1 hour, replicating the potential duration of a spill arising from a significant collision. |

### 7.7.1.1 Stochastic Spill Modelling- Summary of Results for Moderate Exposure Thresholds

The modelling results for the fate of the hydrocarbon from vessel collision at the exposure values defined in Section 7.5.4, for all OAs, are summarised below:

**Floating oil**

At concentrations ≥1 g/$m^2$ could extend up to 59 km from the release location, with the distance reducing to 38 km and 15 km as the thresholds increase to 10 g/$m^2$ and 50 g/$m^2$, respectively.

The Rowley Shoals MP was the only EVAs predicted to be exposed to floating oil exposure at, or above, 1, g/$m^2$ with a probability of 0.33%. The earliest time before floating oil occurred at or above the 10 g/m² threshold was 60 hours (~2.5 days).

**Shoreline accumulation**

Oil accumulation at, or above, the 10 g/$m^2$ threshold was forecasted for Imperieuse Reef MP and Clerke Reef MP with a probability of 0.67% and 0.33%, respectively. The earliest time before oil accumulation occurred at or above the 10 g/m² threshold was 88 hours (~3 days). The maximum volume of oil accumulated with concentrations ≥10 g/m² at Imperieuse Reef and Clerke Reef was estimated to be <1 $m^3$.

No contact was forecast for any EVAs as the threshold increased to 100 g/$m^2$ and 1,000 g/$m^2$.

**Entrained hydrocarbons**

The maximum distance from the release point where hydrocarbons may reach or exceed an exposure level of 1,000 ppb is potentially 41 km from the spill site.

There was no entrained hydrocarbon exposure to any of the EVAs.

**Dissolved hydrocarbons**

Concentrations exceeding the 10 ppb threshold may potentially occur 186 km from the spill site, whilst reducing to 47 km when the thresholds increase to 50 ppb. No concentrations at the 400 ppb threshold were predicted.

Dissolved hydrocarbon exposure at, or above, the 10 g/m$^2$ threshold was forecasted for Imperieuse Reef MP and Clerke Reef MP with a probability of 0.33% for both EVAs. The earliest time before oil accumulation occurred at or above the 10 ppb threshold was 64 hours (~2.5 days). The maximum concentration of dissolved hydrocarbons at Imperieuse Reef and Clerke Reef was estimated to be 17 ppb and 24 ppb, respectively.

### 7.7.2 Nature and Scale of Environmental Impacts

**Potential receptors**: Plankton (including zooplankton and fish and coral larvae), Marine mammals, Marine reptiles, Seabirds and shorebirds, Shallow benthic, intertidal and shoreline habitats, fish and sharks, fisheries, tourism, protected areas, shipping, defence, shipwrecks, Indigenous values, existing oil and gas activity and KEFs, cultural receptors and sea country.

Hydrocarbon spills will cause a decline in water quality and may cause chemical (e.g. toxic) and physical (e.g. coating of emergent habitats, oiling of wildlife at sea surface) impacts to marine species. The severity of the impact of a hydrocarbon spill depends on the magnitude of the spill (i.e. extent, duration) and sensitivity of the receptor. The nature and scale of a hydrocarbon spill is described throughout this chapter for a vessel collision scenario, given smaller hydrocarbon spills (from refuelling) will impact a smaller area than a vessel collision.

MDO is categorised as group II oil (light persistent) with a density of 890.0 kg/m$^3$ at 15ºC (API of 27.5) and a low pour point of −9.0 °C. The low viscosity (14.0 cP at 25 °C) indicates that this oil will spread quickly when released and will form a thin to low thickness film on the sea surface, increasing the rate of evaporation.

A surface release of MDO to the marine environment would result in a localised reduction in water quality in the upper surface waters of the water column near the location of the spill. Generally, about 4% of the MDO mass should evaporate within the first 12 hours (Boiling point (BP) < 180 °C); a further 32.0% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and an additional 54.0% should evaporate over several days (265 °C < BP < 380 °C). Approximately 10% (by mass) of MDO will not evaporate, though will decay slowly over time.

Potential impact pathways (physical and chemical) of hydrocarbon exposure for receptors are summarised in Table 7-17 and potential impacts to receptors found within the EMBA are further described in Table 7-18.

### 7.7.3 Net Environmental Benefit Analysis

See Section 7.6.3 for details on the Net Environmental Benefit Analysis.

### 7.7.4 Environmental Impact Assessment

The impact assessment follows the risk assessment approach as detailed in Section 7.5.5.

#### 7.7.4.1 Identification of Hotspots for Consequence Assessment

As described in Section 7.5.5, all HEVs within the EMBA for LOWC are listed in Table 7-23. The values and sensitivities associated with these HEVs have been described in Appendix C. Further to this, Table 7-23 filters the HEV to identify the Hot Spots where they meet the criteria (as described in Section 7.5.5).

**Table 7-23: Identified high environmental value and hot spot receptors for surface release scenario – marine diesel oil**

| Receptor | HEV Ranking | Hotspot | Hotspot Selection Rationale |
|---|---|---|---|
| **Ara OA** | | | |
| Rowley Shoals and Surrounds* | 3 | N | Submerged receptor with very low probability (0.33%) of floating oil at the low threshold (1/gm$^2$) and dissolved hydrocarbons (0.33%) at the low threshold (≥10 ppb). |
| Clerke Reef MP | 3 | N | Very low probability (0.33%) of shoreline accumulation at the low threshold (≥10/gm$^2$) and no probability of shoreline accumulation ≥100 g/m$^2$). |
| Imperieuse Reef MP | 3 | N | Very low probability (0.67%) of shoreline accumulation at the low threshold (≥10/gm$^2$) and dissolved hydrocarbons (0.33%) at the low threshold (≥10 ppb). No probability of shoreline accumulation ≥100 g/m$^2$). |
| **Mestrel/Bancroft OA** | | | |
| No contact to any HEVS at the low threshold for floating, shoreline accumulation, entrained or dissolved hydrocarbons | | | |

| Receptor | HEV Ranking | Hotspot | Hotspot Selection Rationale |
|---|---|---|---|
| **Curie OA** | | | |
| Clerke Reef MP | 3 | N | Very low probability (0.33%) of shoreline accumulation at the low threshold (≥10/gm$^2$) with no probability of shoreline accumulation ≥100 g/m$^2$). |
| Imperieuse Reef MP | 3 | N | Very low probability (0.33%) of shoreline accumulation at the low threshold (≥10/gm$^2$) and dissolved hydrocarbons (0.33%) at the low threshold (≥ 10 ppb). No probability of shoreline accumulation ≥100 g/m$^2$). |
| Rowley Shoals and Surrounds* | 3 | N | Submerged receptor with very low probability (0.33%) of dissolved hydrocarbons at the low threshold (≥10 ppb). |

No receptors had a contact probability of 5% or above for the medium or high exposure values. Consequently, no hotspots have been identified for the surface release of MDO scenario for any OA. A summary of hydrocarbon modelling results is provided in Appendix H.

### 7.7.4.2 Impact, likelihood and consequence ranking – Marine Diesel Spill

| Description | |
|---|---|
| **Receptors** | • physical environment (water quality and benthic habitats)<br>• marine fauna (cetaceans, turtles, sharks, fish (pelagic), rays, seabirds, benthic fauna, plankton)<br>• marine flora<br>• socio economic receptors (commercial and recreational fishing, tourism, shipping, defence, heritage, indigenous heritage such as totemic species and other petroleum activities). |
| **Consequence** | III-Moderate |

A summary of the consequence assessment for each receptor category is presented below. Potential impact pathway (physical and chemical) of hydrocarbon exposure for receptors are summarised in Table 7-17 and potential impacts to receptors within the EMBA are described in Table 7-18.

**Threatened/migratory fauna**

A surface release of MDO into the marine environment would lead to a localised reduction in water quality in the upper surface waters. Approximately 4% of the MDO mass is expected to evaporate within the first 12 hours, an additional 32% within the first 24 hours, and a further 54% over the course of several days. Around 10% of the MDO will not evaporate, but will gradually decay over time. Surface oil and hydrocarbons entrained in the sea surface layer could physically coat fauna that interact with or beneath the surface, including plankton, pelagic invertebrates and fish, marine reptiles, mammals, and seabirds. Some species may also be affected through the ingestion of oiled fish, as detailed in Table 7-17 and Table 7-18.

*Seabirds*

The EMBA overlaps with the reproduction BIA for several seabird species, including the lesser frigatebird, brown booby, fairy tern, lesser crested tern, little tern, roseate tern, sooty tern and white-tailed tropicbird. While an unplanned release of MDO is not expected to interfere with their reproduction activities, it could have minor secondary effects, such as ingestion after preening or consuming oiled fish, as outlined in Table 7-17 and Table 7-18.

*Marine mammals*

The EMBA overlaps with numerous marine mammal BIAs, including the pygmy blue whale (feeding and migration), humpback whale (resting and migration), southern right whale (reproduction and migration), dugong (reproduction and feeding) and Australian sea lion (feeding). The EMBA also overlaps the whale shark feeding BIA. There is the potential for behavioural disruption to local populations of these species as individuals traverse the area affected, with potential for coating of marine mammals and ingestion of oiled prey (plankton/fish) as described in Table 7-17 and Table 7-18.

*Reptiles*

The EMBA overlaps BIAs and critical habitat for survival of the loggerhead turtle, hawksbill turtle, green turtle and flatback turtle (outlined in Table 3-10). The nearest known turtle nesting beach (Bedout Island) is ~65 km from the closest OA (Mestrel/Bancroft). The flatback turtle reproduction BIA internesting buffer intersects with the Mestrel/Bancroft OA. An unplanned surface release of MDO could lead to behavioural disruptions that threaten turtle populations.

Deteriorating water quality, chemical discharge, and terrestrial runoff are identified as potential threats to turtles, as well as to some bird and shark species. Habitat modification, degradation, pollution, and loss of habitat are also recognised threats to sharks, birds, cetaceans, and turtles in various conservation management and recovery plans. Given the offshore location and volume of the potential hydrocarbon release, there is limited potential for habitat modification or a decrease in the availability of quality habitat (shorelines/subsurface). Shoreline accumulation may pose a significant disruption to coastal fauna, but the volumes of accumulated MDO are unlikely to result in a substantial reduction in the area available for seabird or turtle species.

**Physical environment and habitats**

In the event of an MDO release, hydrocarbons that reach nearshore environments could potentially impact benthic coral reefs and mangrove areas, leading to a decrease in ecological values due to the toxic effects of hydrocarbon exposure. However, Imperieuse Reef and Clerke Reef were the only receptors expected to accumulate shoreline oil concentrations ≥10 g/m² in the event of a worst case MDO spill, with a maximum of <1 m$^3$ of shoreline oil accumulation and <1 km of shoreline affected

| Description |
|---|
| at a very low probability (0.67% and 0.33% respectively). The quality of habitat may be reduced but is considered localised and insignificant with rapid recovery (within ~two years).<br>As described above, accumulated hydrocarbons could impact marine fauna that utilize the area.<br>**Protected areas**<br>The EMBA intersects several AMPs, Commonwealth Heritage Areas and state protected areas (see Section 3.2.5). Combined, these areas support all the habitats and faunal groups described above. Impacts to the habitat/fauna receptors described above therefore have an impact on the values of these reserves which could have flow-on effects to tourism revenue of coastal communities that provide access to these marine reserves.<br>**Socio-economic receptors**<br>There is the potential for hydrocarbons to temporarily disrupt fishing activities if the surface hydrocarbons moves through fishing areas. However, the high rate of evaporation means little MDO will become entrained, and few aromatic hydrocarbons are predicted to become dissolved.<br>It is possible there could be accumulation of oil in fish tissues to the extent that could result in hydrocarbon tainting of fish flesh. Connell and Miller (1981) compiled a summary of studies listing the exposure value concentrations at which tainting occurred for hydrocarbons. The results contained in their review indicate tainting of fish occurs when fish are exposed to ambient concentrations of 4–300 ppm (4,000–300,000 ppb) of hydrocarbons in the water, for durations of 24 hours or more, with response to phenols and naphthenic acids being the strongest.<br>Given the volume of oil that could be potentially released, the impacts to fisheries on a stock level will not lead to significant reduction of population supporting the local activity.<br>Tourism could also be affected by a spill, either from reduced water quality/shoreline oiling preventing recreational activities or reducing aesthetic appeal or from impacts to habitats and marine fauna. However, considering the characteristics of MDO, the impact will be short term and temporary.<br>**Cultural Heritage and Features**<br>Shoreline accumulation or contact by floating oil to an emergent receptor is not expected. However, potential impacts to cultural features from a hydrocarbon spill may include a decline in traditional food sources and /or mortality of fauna with cultural significance. Shoreline accumulation may pose a significant disruption to coastal fauna, but the volumes of accumulated MDO are unlikely to result in a substantial reduction in the area of habitat available for seabird or turtle species (e.g. traditional food sources).<br>During EP stakeholder consultation, Ngarluma Aboriginal Corporation requested they be notified in the event of a spill that may contact their area of interest. This has been included in the notifications table (Table 8-6). |
| **Likelihood** B – Unlikely |
| A worst-case hydrocarbon release resulting from a vessel collision could result in disruption and short-term effects on the receiving environment. Impacts could result in detectable but insignificant decrease in local population size and habitats. However, recovery would be expected within two years. With the proposed control measures in place to prevent releases, any decline in local populations or degradation of habitats is considered unlikely and therefore the activity will be conducted in a manner that is considered acceptable.<br>The likelihood of a hydrocarbon release occurring due to a vessel collision/bunkering is limited, given the set of mitigation and management controls in place. Subsequently the likelihood of a vessel collision releasing hydrocarbons to the environment resulting in a minor consequence is considered to be Unlikely (b). |
| **Residual Risk** Low |

### 7.7.5 Environmental Performance Outcomes and Control Measures

The EPO relating to this event includes:

- No loss of containment of hydrocarbon to the marine environment [BB-EPO-10]

The control measures applied to prevent hydrocarbon spill from refuelling and vessel collision are shown in Table 7-24 and the EPS and measurement criteria for this EPO are described in Section 8.4.

Selection of oil spill response strategies and associated performance outcomes, control measures and performance standards, including those required to maintain preparedness and for response, are detailed within the OPEP. The OPEP contains an evaluation of oil spill preparedness arrangements to demonstrate that oil spills will be mitigated to ALARP.

**Table 7-24:Control measure evaluation for hydrocarbon spill – MDO**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-53 | Bulk liquid transfer procedure | Administrative | Bulk liquid transferred in accordance with bulk transfer procedures to reduce the risk of an unintentional release to the sea. | Cost to implement<br>Ongoing procedure.<br>Cost of purchasing and maintaining equipment (e.g. bulk hoses and connections). | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh the costs. |
| BB-CM-51 | MODU and vessel spill response plans (SOPEP/ SMPEP) | Administrative | Implements response plans on board vessels to deal with unplanned hydrocarbon releases and spills quickly and efficiently in order to reduce impacts to the marine environment. | Administrative costs of preparing documents. Generally undertaken by vessel contractor so time for Santos personal to confirm and check SOPEP/ SMPEP in place. | **Adopted**<br>environmental benefits of ensuring response plans in place, are followed and measures implemented outweighs the cost. |
| BB-CM-01 | Maritime Notices | Administrative | Ensures other marine users are aware of the presence of vessels. | Costs associated with the personnel time in issuing notifications and closing out queries and responses. | **Adopted**<br>**I**t is a regulatory requirement. |
| BB-CM-06 | Support vessel presence | Protective | Minimises risk of collision through visual identification and avoidance of other vessels. | Negligible costs. | **Adopted**<br>Benefits considered to outweigh costs. |
| BB-CM-55 | Accepted OPEP | Administrative | Implements response plans to deal with an unplanned hydrocarbon release quickly and efficiently in order to reduce impacts to the marine environment. | Administrative costs of preparing documents and large costs of preparing for and implementing response strategies. | **Adopted**<br>Regulatory requirement must be adopted. |
| BB-CM-04 | MODU identification system | Engineering | Ensures vessels meet minimum safety standards, therefore reducing potential for vessel collision events with associated diesel spill to the environment. | Costs are standard. | **Adopted**<br>Benefits considered to outweigh costs to Santos. |
| BB-CM-07 | Lighting will be used as required for safe work conditions and | Engineering | Ensures vessels meet minimum safety standards, therefore | Costs associated with personnel time in checking vessel | **Adopted**<br>It is a regulatory requirement. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | navigational purposes | | reducing potential for vessel collision events with associated diesel spill to the environment.<br>Marine Order Part 30: Prevention of Collisions, and with Marine Order Part 21: Safety of Navigation and Emergency Procedures requires vessels to have navigational equipment to avoid collisions. Requirement of the Navigation Act 2012. | certifications are in place.<br><br>Negligible costs of operating navigational equipment. | |
| BB-CM-08 | Seafarer Certification | Administrative | Requires appropriately trained and competent personnel, in accordance with Marine Order 70, to navigate vessels to reduce interaction with other marine users.<br>Requires appropriately trained and competent personnel to navigate vessels. | Costs associated with personnel time in obtaining qualifications. | **Adopted**<br>It is a regulatory requirement. |
| BB-CM-11 | Marine Assurance Standard | Administrative | Ensures vessels meet Marine assurance standards to reduce the likelihood of unplanned discharge. | Costs associated with personnel time in checking vessel. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented and that the vessels are compliant outweigh the costs. Regulatory requirement must be adopted. |
| BB-CM-29 | Fuel oil quality | Substitute | Use of diesel reduces the potential impacts to marine environment in the event of unplanned hydrocarbon spills or leaks during bunkering. | Additional personnel costs of ensuring vessels are using the required fuel. | **Adopted**<br>Benefits of ensuring procedures are followed outweighs the minimal costs of personnel time. |
| BB-CM-03 | Petroleum Safety Zone (PSZ) and Cautionary Zone | Eliminate | Reduces the potential for third-party vessel | No additional costs. | **Adopted** |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | (2,000 m) established | | collision with the activity vessels when they are working in these exclusion zones. The Cautionary Zone alerts other marine users to the presence of the MODU. | | Legislative requirement. |
| BB-CM-02 | Santos' Relevant Persons consultation Strategy | Administrative | Santos will notify all relevant stakeholders listed in Table 8-4 of activity details prior to commencement, including activity timing, vessel movements, proposed cessation date and vessel details.<br>Ensures other marine users, such as commercial fishers, are aware of upcoming operations so they can plan their business accordingly. | Limited additional costs to Santos. Stakeholders' time required to review consultation material and communicate with Santos. | **Adopted**<br>Benefits considered to outweigh negligible costs. Important control to ensure other marine users are aware of upcoming operations and potential business disruptions. |
| BB-CM-24 | MODU Planned Maintenance System (PMS) | Administrative | MODU equipment is operating within its parameters, reducing the risk of unplanned discharges to the marine environment | Costs are standard for routine PMS. | **Adopted**<br>Benefits considered to outweigh costs to Santos. |
| BB-CM-25 | Vessel PMS to maintain vessel DP, engines and machinery | Administrative | Ensure vessel is running efficiently and routine maintenance endeavours to ensure risk of collision form vessel system failure is reduced. | No additional costs, is industry best practice. | **Adopted**<br>No additional costs. |
| BB-CM-56 | Pre-campaign commencement assurance check | Administrative | Ensures consideration of worst-case hydrocarbon spill scenario for the proposed activity based on actual MODU, vessel and activity details. | Administrative costs to undertake assurance check and risk assessments for each campaign | **Adopted**<br>Benefits considered to outweigh costs to Santos. |
| **Additional Control Measures** | | | | | |
| BB-CM-13 | Work with AMSA to temporarily modify shipping fairway | Administrative | Reduces potential interaction with other marine | Possible time and coordination costs with AMSA; | **Adopted**<br>The safety benefits considered to |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | traffic during activities within the Mestrel and Curie OAs (see Section 6.1.5.1) | | users by avoiding peak shipping traffic in recognised shipping fairways during the activity. | may affect drilling schedule flexibility. | outweigh costs to Santos. |
| BB-CM-17 | Adaptive management plan/vessel traffic management plan for when drilling within a shipping fairway | Administrative | Vessel traffic management plan, reduces likelihood of vessel collision and oil spill potential | Costs associated with plan development and industry consultation. | **Adopted** Safety benefits considered to outweigh considerable costs to Santos |
| BB-CM-16 | For drilling activities within a shipping fairway, a support vessel can act in the capacity of a guard vessel in place during the activity to reduce potential for collision or interference with other marine users. | Protective | Identifies and communicates with approaching third-party vessels to ensure exclusion (safety) zone is observed, preventing potential interaction or interference. | Vessel will have support and guard duties. | **Adopted** The safety benefits considered to outweigh costs to Santos |
| BB-CM-15 | If drilling activities in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to electronic navigation systems | Engineering | Reduces potential for interaction with other users during MODU moves. | Costs associated with additional system | **Adopted** The safety benefits outweigh any cost given the location of the OAs to known shipping fairways. |
| BB-CM-14 | If drilling in a shipping fairway, MODU Racon Unit installed prior to MODU arrival | Engineering | Reduces potential for interaction with other users during MODU moves. Installation of RACON unit on MODU is an additional navigational radar aid for commercial shipping traffic utilising shipping fairways. | Costs associated with RACON unit installation and operation. | **Adopted** The safety benefits of a RACON outweighs any cost given the location of the OAs to known shipping fairways. |
| N/A | Zero fuel bunkering via hose | Eliminate | Removes spill risk from hose operations. | Cost associated with transfer of MDO via drums or containers. Not possible to modify MODU to allow additional fuel storage. Cost associated with vessel transits and risk transfer to Health and Safety issues with additional trips to port instead. Would significantly increase the | **Not Adopted** Storage of fuel on MODU would result in unacceptable transfer of environmental risks to OHS/operational risks and would not eliminate risk of MDO spills to sea. Costs associated with implementing control is deemed grossly disproportionate to environmental benefit and low risk activity with |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | schedule to include multiple trips. | standard controls in place. |
| N/A | Schedule activities to avoid coinciding with sensitive periods for marine fauna present in the operational area | Eliminate | Potential reduction in risk of a hydrocarbon spill to some sensitive receptors | Impracticable to schedule activities to avoid all listed marine fauna due to variability in timing of environmentally sensitive periods and the constant or unpredictable presence of some species. Short duration activity (i.e. a few days) that is low risk to marine fauna. | **Not Adopted**<br>Cost is disproportionate to increase in environmental benefit |
| N/A | Dedicated resources (e.g. dedicated spill response facilities on location) in the event of loss of hydrocarbons to allow rapid response | Protective | May allow for quicker response to a spill as resources will be within close proximity. | Large costs associated with a dedicated resource on location. New modelling shows no shoreline contact. | **Not Adopted**<br>Large cost associated with dedicated resources on location deemed grossly disproportionate compared to low risk of large MDO spill and subsequent rapid dispersion and evaporation. |
| N/A | Require all support vessels involved in the activity to be double hulled. | Eliminate | Reduces the likelihood of a loss of hydrocarbon inventory in the highly unlikely event of a vessel collision, minimising potential environmental impact. | Vessels are subject to availability and are required to meet Santos WA's standards during activities; requirement of a double hull on vessels would limit the number available to Santos WA; also, requiring vessels to be refitted to ensure double hulls would be of high cost. | **Not Adopted**<br>Large costs associated with vessel selection and by having an activity schedule determined by vessel availability considered to be grossly disproportionate compared to low risk of a vessel collision and low risk of a large diesel spill. |
| N/A | Additional support vessel dedicated to identifying errant vessels (during pre-drill surveys) | Protective | Additional vessel may identify errant vessels in proximity to the activities. | Additional vessels in the OA – increase collision risk<br>Additional cost related to contracting vessel | **Not Adopted**<br>Additional cost outweigh negligible benefit |
| N/A | Revise OAs or well locations to be outside of fairways | Eliminate | Reduces interaction with shipping using known fairways | It is not feasible for the Wallace, Curie and Mestrel/Bancroft OAs to be located outside of shipping fairways. | **Not adopted**<br>Not feasible |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| | | | | The wells within these OAs are targeting specific target formations and it may not be feasible to move the tophole of the wells so the OA is located outside of the shipping fairway. | |

### 7.7.6 Demonstration of as Low as Reasonably Practicable

The use of vessels is essential to undertake the planned offshore activities, and therefore, the associated risks of unplanned hydrocarbon releases—such as during bunkering or due to vessel collision cannot be eliminated. Offshore refuelling is a standard industry practice, and all vessel operations, including hydrocarbon transfers, are managed in accordance with applicable oil pollution legislation, including the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983, MARPOL Annex I*, and associated Marine Orders. To further reduce potential environmental consequences to ALARP, only MDO will be used in the OAs.

Standard control measures (Table 7-24) are in place to minimise the likelihood and consequence of a hydrocarbon release. These include the implementation of a bulk liquid transfer procedure, which ensures that bulk liquids, including fuel, are transferred in accordance with standardised protocols to reduce the risk of unintentional releases to the marine environment. The procedure requires appropriate equipment (e.g. hoses and connectors) to be maintained and used during all transfers, with operational checks and procedures enforced to manage risk. Vessel-specific spill response plans (SOPEP/SMPEP) are in place to ensure a rapid and effective response to any release.

A combination of administrative controls, such as Santos' marine assurance standard, pre-campaign assurance checks, and the requirement for certified seafarers (Marine Order 70), ensures vessels are operated and manned to recognised industry and regulatory standards. Engineering controls including support vessel presence, MODU identification systems, and certified navigational lighting (per Marine Orders 21 and 30) reduce collision risks. Vessel and MODU planned maintenance systems ensure engines, dynamic positioning, and fuel-handling systems remain within operational tolerances to reduce the risk of failure or leaks.

The accepted OPEP provides a framework for coordinated response actions in the event of a hydrocarbon spill, and stakeholder consultation ensures that marine users are made aware of the activity and can avoid potential interference. Collectively, these measures reduce the risk of an unplanned release to ALARP.

Additional safety controls have also been adopted for activities undertaken in shipping fairways, including the installation of a RACON unit on the MODU when to enhance radar visibility to third-party vessels transiting in shipping fairways. An AIS Aid to Navigation (AtoN) device will also be used to broadcast the MODU position to electronic navigation systems. The support vessel will act in the capacity of a guard vessel when activities occur in a shipping fairway to identify and communicate with approaching third-party vessels, including during survey activities prior to MODU arrival. Additional controls to ensure impacts to shipping fairway traffic are reduced to levels which are acceptable and ALARP (BB-CM-13 and BB-CM-17) have been adopted, to ensure the impacts and risks are continuously managed to ALARP and acceptable levels for activities conducted within a shipping fairway (Section 6.1.5.1).

Additional control measures (Table 7-24) were considered but not adopted where they were found to be impractical or the cost grossly disproportionate to the potential environmental benefit.

- Zero fuel bunkering via hose was not adopted due to the impracticality of transferring MDO via drums or containers, limited MODU storage capacity, and increased health and safety risks associated with additional port calls.
- Requiring double-hulled support vessels was not adopted due to vessel availability constraints, high retrofitting costs, and the already low likelihood of vessel collision.
- Similarly, rescheduling the activity to avoid all sensitive fauna periods was deemed impractical due to the variability and unpredictability of species presence and the short duration and low-risk nature of the activity.
- The deployment of dedicated spill response resources at the activity location was not adopted based on high mobilisation costs and low likelihood of a large spill event, supported by modelling that predicts no shoreline contact.

- An option to add an extra support vessel to identify errant third-party vessels was also not adopted due to limited benefit and the increased collision risk associated with adding more traffic to the operational area.
- Relocating the OAs outside of shipping fairways was also assessed and not adopted. The location of the wells is dictated by specific geological targets, and moving the top hole location would require significant directional drilling, leading to increased costs, technical complexity, and a higher volume of drill cuttings being discharged). Given the scale and duration of the drilling activities and the small size of the exclusion zone compared to the wider marine area available to other users, the potential benefits of relocating the wells would not outweigh the environmental and financial costs.
- Santos has considered alternative methods to access subsurface targets situated below shipping fairways such as drilling of deviated / horizontal wells. However, given the width of the shipping fairways of 3 nm (~5.6 km), this is not considered feasible when also accounting for the deep vertical depth of the subsurface targets. This style of well is extremely challenging to design and execute and these types of techniques are typically utilised for field development (production wells) where substantial amounts of subsurface data are available for engineering and planning, which enables mitigation of operational risk. For exploration drilling, there is inadequate data available to plan complex, extended or extreme reach wells. Therefore, alternative drilling techniques such as deviated / horizontal / extended reach wells are assessed as not technically feasible.

With the implementation of the chosen controls, which span prevention, preparedness, and rapid response, and with no further reasonably practicable measures identified, the residual risk of a hydrocarbon spill from vessels is considered Low and the impact is reduced to ALARP.

### 7.7.7 Acceptability Evaluation

| | |
|---|---|
| **Is the risk ranked between Very Low to Medium?** | Yes – residual risk is ranked as Low. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' *Environmental Hazard Identification and Assessment Procedure*, which considers principles of ESD.<br>The residual risk for this aspect is Low and therefore does not affect the outcomes of the principles of ecologically sustainable development as per Table 5-5. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – management consistent with OPGGS(E)R 2023 including safety case and WOMP. Santos has considered the values and sensitivities of the receiving environment, including, but not limited to conservation values of the identified protection priorities (Section 3.2), relevant species recovery plans, conservation management plans and management actions (Table 3-11). |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy. |
| **Are risks and impacts consistent with stakeholder expectations?** | During consultation with AMSA, the risk of vessel collision related to shipping fairway intersection was raised. Santos has addressed these comments and provided further clarification on these matters in Section 6.1.5.1. |
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

Given the control measures in place to prevent vessel collision and refuelling incidents, and the low frequency of significant volume diesel spills that occur in the industry, the likelihood of a loss of containment event during the activity is unlikely. The risks from diesel spills are well understood and the activities will be managed in accordance with relevant legislation and standards. The control measures proposed are consistent with applicable actions described in the relevant recovery plans and approved conservation advice and no stakeholder concerns have been raised regarding this aspect.

With the implementation of industry standard and activity-specific control measures to reduce the chance of a diesel spill event (and minimise impacts), the residual risk is assessed to be Low and ALARP. Control measures will reduce the risk of impact from MDO spill to a level that is acceptable.

# 7.8 Minor Hydrocarbon Release (Surface and Subsea)

## 7.8.1 Description of Event

| | |
|---|---|
| **Event** | Causes for accidental hydrocarbon releases include:<br>• hydraulic fluids, lubricant oils and (stored) waste oil<br>• ROV failure (including oil seal, hydraulic system hose and quick disconnect system failures)<br>• loss of primary containment (drums, tanks, intermediate bulk containers [IBCs], etc) due to handling, storage and dropped objects (e.g. swinging load during lifting activities)<br>• vessel or MODU pipework failure or rupture, hydraulic hose failure, inadequate bunding<br>• dropped objects damaging MDO infrastructure (hoses, pipes, tanks, etc)<br>• helicopter refuelling loss of containment of aviation fuel<br>• flare drop out during well evaluation (<500 L).<br>The vessels main engines and equipment such as pumps, cranes, winches, power packs and generators require MDO for fuel and a variety of hydraulic fluids and lubricating oils for efficient operation and maintenance of moving parts. These products are present within the equipment and also held in storage containers and tanks on the vessels. Small hydrocarbon leaks could occur from loss of primary containment due to handling, storage and dropped objects (during lifting activities). Volumes are likely to be small and limited to the volume of individual containers (e.g. IBC, 44-gallon drums) stored on the deck of vessels. The credible spill for this scenario is considered to be the loss of an IBC (1 $m^3$) during transfer from a support vessel to a primary vessel.<br>Equipment deployed overboard during activities (e.g. ROV operations and subsea cutting and infrastructure recovery) can result in unplanned discharges (of hydraulic fluids) directly to the marine environment due to equipment failure, equipment interactions with the vessel thrusters and/or accidental contact with subsea equipment.<br>Flaring is required to ascertain the pressure, flow characteristics and composition of the reservoir fluids if encountered. Flaring may be interrupted by pressure drops, incomplete combustion, or higher than anticipated drilling fluid content in the flaring system during well evaluation. As a result of flaring drop out, formation fluids may subsequently be discharged into the marine environment. Similarly, some flowback cushioning fluids may accidentally be released during well testing. Spilt volumes due to drop out from flaring and well evaluation are difficult to estimate. Given the automatic and manual systems in place during flaring, the accidental release of hydrocarbon is expected to be low (<500 L).<br>Minor accidental loss of other hydrocarbon-based liquids (e.g. used lubricating oils, cooking oil, and hydraulic oil) to the marine environment could also occur via tank pipework failure or rupture, hydraulic hose failure, inadequate bunding and/or storage, insufficient fastening or inadequate handling which could result in impacts to water quality and hence sensitive environmental receptors. |
| **Extent** | Below toxic/harmful threshold concentrations are expected to occur at short distances from the hydrocarbon spill / release point. Impacts beyond the operational area in which it was released are not expected to occur. |
| **Duration** | Potentially toxic/harmful threshold concentrations limited to a very short period immediately following release, i.e. in the order of hours. |

## 7.8.2 Nature and Scale of Environmental Impacts

**Potential receptors**: Physical environment (water and sediment quality, benthic habitats), threatened, migratory or local fauna (marine mammals, marine reptiles, sharks and rays, fish and birds), cultural receptors.

### 7.8.2.1 Physical Environment

Hydraulic fluids and lubricating oils exhibit similar behaviour to MDO when released into the marine environment (see Section 7.5.3.2 for details on MDO behaviour). Hydraulic fluids, which are medium oils with light to moderate viscosity, spread relatively quickly and, like MDO, tend to dissipate rapidly, especially in rough sea conditions.

Small volumes of hydrocarbons released into the marine environment may result in localized contamination of the water column near the MODU and support vessels. The potential impacts would likely remain confined to the immediate area of the spill, with rapid dispersion reducing concentrations below impact thresholds in the open ocean. Given the small quantities involved and the expected rapid dispersal, any impact on water quality is unlikely to have further effects on sediment quality or benthic habitats. There is no emergent or intertidal habitat at risk from surface spills, and minor volumes of hydrocarbons are unlikely to reach shorelines.

### 7.8.2.2 Threatened, Migratory or Local Fauna

Minor and short-term changes to water quality are not expected to impact marine fauna such as pelagic fish, sharks, marine mammals, reptiles, or seabirds. As outlined in Table 3-10, the feeding BIA for whale shark overlaps with the OAs, indicating the possibility of presence of these species. In addition, the Mestrel/Bancroft OA is directly

adjacent to the reproduction (internesting buffer) BIA for flatback turtles (Figure 3-17). A number of Recovery Plans and Conservation Advice for threatened and migratory species that may occur within the OAs (Table 3-11) identify marine pollution and deteriorating water quality (chemical discharge) as a threat to the species. However, small hydrocarbon spills are unlikely to have a significant ecological effect on these species, due to the limited volumes that could be released and the open ocean environment. The risk of physical coating or lethal/sub-lethal toxicity to marine fauna from accidental hydrocarbon releases is considered low, given the expected low concentrations and brief exposure periods.

#### 7.8.2.3 Socio-economic Receptors

Considering the localised and temporary nature of impacts from an unplanned hazardous liquid spill, any effects on commercial fishing, tourism, and recreational activities are deemed unlikely.

#### 7.8.2.4 Cultural receptors

Totemic species of cultural value may pass through the OAs; however, during consultation, Santos has not been made aware of any other cultural receptors within the OAs. Impacts to local fauna have been considered in Section 7.8.2.2.

### 7.8.3 Environmental Performance Outcomes and Control Measures

The EPOs relating to this event include:

- No loss of containment of hydrocarbon to the marine environment [BB-EPO-10]
- No unplanned objects, emissions or discharges to sea or air [BB-EPO-06]
- No injury or mortality to EPBC Act and BC Act listed marine fauna during activities [BB-EPO-05]

The control measures considered for this event are shown in Table 7-25 and EPS and measurement criteria for the EPOs are described in Table 8-2.

**Table 7-25: Control measure evaluation for minor release of hydrocarbon**

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| **Standard Control Measures** | | | | | |
| BB-CM-46 | Dropped object prevention procedure | Administrative | Minimises dropped object risk during vessel lifting operations that may cause secondary spill resulting in reduction in water quality. Ensures lifting equipment certified and inspected. | Personnel costs to maintain lifting equipment and implement procedure. | **Adopted** Benefits of ensuring procedures are followed and measures implemented outweighs costs. |
| BB-CM-47 | Hazardous chemical management procedures | Administrative | Reduces the risk of spills and leaks (discharges) to the sea by controlling the storage, handling, and clean-up of hazardous chemicals. | Personnel costs associated with permanent or temporary storage areas. | **Adopted** Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time. |
| BB-CM-48 | International Maritime Dangerous Goods Code | Administrative | Reduces the risk of an environmental incident, such as an accidental release to sea or unintended chemical reaction. | Cost of implementing procedures. Regulatory requirement. | **Adopted** Benefits outweigh the costs. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| BB-CM-51 | MODU and support vessel spill response plans | Administrative | Implements a response plan to deal with an unplanned hydrocarbon spill quickly and efficiently in order to reduce impacts to the marine environment. | Personnel cost associated with ongoing management (spill response exercises) and implementation of plans. | **Adopted**<br>Benefits of ensuring response plans in place, are followed and measures implemented and that the vessels are compliant outweighs costs. |
| BB-CM-63 | Remotely operated vehicle (ROV) inspection and maintenance procedures | Engineering | Maintenance and pre-deployment inspection on ROV completed as scheduled to reduce the risk of hydraulic fluid releases to the marine environment. | Additional personnel costs of ensuring procedures in place and followed. | **Adopted**<br>Benefits of ensuring procedures are followed outweigh costs. |
| BB-CM-55 | Oil pollution emergency plan (OPEP) | Administrative | Implements response plan to deal with an unplanned hydrocarbon spill quickly and efficiently in order to reduce impacts to the marine environment. | Personnel and administrative costs associated with preparing documents ongoing management (spill response exercises) and implementation of OPEP. | **Adopted**<br>Benefits considered to outweigh costs to Santos. |
| BB-CM-24 | MODU Planned Maintenance System | Administrative | MODU equipment is operating within its parameters, reducing the risk of unplanned discharges to the marine environment | Costs are standard for routine PMS. | **Adopted**<br>Benefits considered to outweigh negligible costs to Santos. |
| BB-CM-25 | Vessel Planned Maintenance System | Engineering | Reduces potential for unplanned releases of chemicals from the vessels because equipment is operating within its parameters. | Costs are standard for routine PMS. | **Adopted**<br>Benefits outweigh the cost. |
| BB-CM-53 | Bulk liquid transfer procedure | Administrative | Bulk liquids transferred in accordance with the bulk transfer procedure to reduce the risk of a release to sea. | Cost to implement<br>Ongoing procedure.<br>Cost of purchasing and maintaining equipment (e.g. bulk hoses and connections). | **Adopted**<br>Benefits outweigh the cost. |
| BB-CM-32 | Well test procedures | Administrative | Includes control measures that reduce the risk of hydrocarbons from entering the marine environment. | Cost associated with implementing procedures. | **Adopted**<br>Benefits of ensuring procedures are followed outweighs costs. |

| CM Reference No. | Control Measure | Hierarchy of Control | Environmental Benefit | Potential Cost/Issues | Evaluation |
|---|---|---|---|---|---|
| BB-CM-37 | Chemical selection procedure | Administrative | Improves water quality discharge (reduced toxicity) to the marine environment in the event of an unplanned release. | Cost associated with implementation of procedure. Range of chemicals reduced but potentially higher costs. Potential additional cost and delays of chemical substitution. | **Adopted**<br>Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time. |
| **Additional Control Measures** | | | | | |
| NA | Eliminate vessel to vessel lifting in field | Eliminate | Reduces the risk release of hydrocarbon to the marine environment from hydrocarbon containers or secondary impact with hydrocarbon containing equipment due to dropped objects. | Eliminating lifting would require MODU/vessels storing more equipment and supplies on-board, and/or additional trips to shore. MODU/vessels will not have enough deck space to store all required equipment, materials, supplies needed for the duration of the activity. | **Not adopted**<br>Not feasible to eliminate lifting in the field. |

### 7.8.4 Environmental Impact Assessment

| Description | |
|---|---|
| **Receptors** | • physical environment (water and sediment quality, benthic habitats)<br>• threatened, migratory or local fauna (marine mammals, marine reptiles, sharks, fish, rays and birds) |
| **Consequence** | II-Minor |

In the event of a minor hydrocarbon spill, the quantities would be limited to ~1 $m^3$ for the loss of the contents of an IBC. The small volumes, dilution and dispersion from natural weathering processes such as ocean currents are such that spills will be limited in area and duration. The number of receptors present at the activity location are expected to be limited to a small number of transient individuals.

The susceptibility of marine fauna to hydrocarbons is dependent on hydrocarbon type and exposure duration; however, given that exposures would be limited in extent and duration, exposure to marine fauna from this hazard is considered to be low. The small volumes of worst-case discharges are such that, the impacts to receptors will decline rapidly with time and distance at the sea surface. Rapid dilution at depth would also result in the impacts to receptors declining rapidly with time and distance.

Deteriorating water quality and marine pollution are identified as potential threats to a number of marine fauna species in relevant Recovery Plans and Conservation Advice (Table 3-11). With control measures in place, the activity will be conducted in a manner that reduces potential impacts to ALARP and an acceptable level.

Toxic impacts to the benthic communities would be limited to a highly localised area around the release location for a subsea release. Impacts from surface spills to benthic communities are not expected due to the water depths.

Near the sea surface, fish are able to detect and avoid contact with surface slicks and as a result, fish mortalities rarely occur in open waters from surface spills (Kennish, 1997; Scholz et al., 1992). Pelagic fish species are therefore generally not highly susceptible to impacts from hydrocarbon spills. In offshore waters near to the release point, pelagic fish are at risk of exposure to the more toxic aromatic components of the hydrocarbons. Pelagic fish in offshore waters are highly mobile and comprise species such as tunas, sharks, and mackerel. Due to their mobility, it is unlikely pelagic fish would be exposed to toxic components for long periods in this spill scenario. The more toxic components would also rapidly evaporate, and concentrations would significantly diminish with distance from the spill site, limiting the potential area of impact. The potential minor hydrocarbon releases are not expected to significantly impact the receiving environment with control measures proposed to prevent releases; therefore, the activity will be conducted in a manner that is considered acceptable.

EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.

| Description | |
|---|---|
| Given a small hydrocarbon spill would not result in insignificant change to a local population, industry or ecosystem factor, it is expected that a spill of this nature would result in II Minor consequence. | |
| **Likelihood** | C-Possible |
| Marine turtles, marine mammals and birds, receptors are expected to be present in the OAs at various times of the year.<br>With appropriate controls in place to prevent spills and procedures to clean up spills, the likelihood of releasing minor volumes of hydrocarbons to the environment is assessed as C – Possible. | |
| **Residual Risk** | Low |

### 7.8.5 Demonstration of as Low as Reasonably Practicable

The activity requires the storage and use of hydraulic and lubricating oils for the operation of equipment and machinery, including ROV systems. Additionally, well testing may be required to evaluate reservoir performance. As these substances are essential to the activity, their removal is not viable. Several standard control measures have been adopted to minimise the risk of unplanned releases and to manage the consequences should a spill occur. These include comprehensive hazardous chemical management procedures, adherence to the International Maritime Dangerous Goods Code, and the implementation of bulk liquid transfer procedures, all of which ensure proper handling, storage, and transfer of hydrocarbons and hazardous liquids to reduce spill likelihood.

Operational integrity is further maintained through the MODU and support vessel planned maintenance systems, which ensure that equipment remains within performance limits to avoid failure. In addition, ROV inspection and maintenance procedures are implemented prior to deployment to reduce the risk of hydraulic fluid releases. Dropped object prevention procedures mitigate secondary spill risks during lifting operations. Chemical selection procedures (Section 2.5) ensure that only environmentally acceptable substances are used, thereby reducing toxicity and environmental consequences in the event of a release.

Preparedness for unplanned releases is supported through implementation of vessel-specific spill response plans and an accepted OPEP, which includes response strategies tailored to minor hydrocarbon spill scenarios. These plans are supported by crew training and periodic spill response exercises.

Well test procedures incorporate controls that manage hydrocarbon handling and minimise the risk of marine discharge during testing operations. When implemented in combination, these measures reduce both the likelihood and consequence of minor hydrocarbon releases, such as from ROV leaks or hydraulic systems.

Additional control measures (Table 7-25) were considered but not adopted. In particular, eliminating vessel-to-vessel lifting in the field was assessed as a way to reduce the potential for equipment drops that could lead to secondary spills. However, this was found to be operationally unfeasible, as it would require vessels and the MODU to store all necessary equipment and supplies onboard for the full duration of the activity, which is impractical due to space and logistical constraints. It would also require more frequent return trips to port, increasing fuel consumption and operational risk.

Given the minor, localised nature of any potential spill and the effectiveness of the adopted control measures, the residual risk of minor hydrocarbon releases is considered Low and reduced to ALARP. No additional controls have been identified that would further reduce the risk in a practicable or proportionate way.

### 7.8.6 Acceptability Evaluation

| | |
|---|---|
| **Is the risk ranked between Very Low to Medium?** | Yes – maximum minor hydrocarbon spill residual risk is ranked as Low. |
| **Is further information required in the consequence assessment?** | No – potential impacts and risks are well understood through the information available. |
| **Are risks and impacts consistent with the principles of ESD?** | Yes – activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure which considers principles of ecologically sustainable development. |
| **Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines, and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian Marine Park zoning objectives)?** | Yes – management consistent with SOLAS 1974 and *Navigation Act 2012*, Marine Order 91 (Marine pollution prevention – oil) and with relevant recovery plans and conservation advice for species that may occur in the OAs (Table 3-11) |
| **Are risks and impacts consistent with Santos' Environment Policy?** | Yes – aligns with Santos' Environment Policy |
| **Are risks and impacts consistent with stakeholder expectations?** | No concerns were raised during consultation on the EP. |

| | |
|---|---|
| **Are performance standards such that the impact or risk is considered to be ALARP?** | Yes – see ALARP above. |

With control measures in place to prevent the accidental release of small volumes of hydrocarbons, and the potential social and environmental impacts and risks well understood and deemed low, the environmental risk associated with minor hydrocarbon releases is considered acceptable.

# 8. Implementation Strategy

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 22(1) Implementation Strategy for the Environment Plan** |
| The environment plan must contain an implementation strategy for the activity in accordance with this section. |

The specific measures and arrangements that will be implemented in the event of an oil pollution emergency are detailed within the *Bedout Multi-Well Exploration and Appraisal Drilling OPEP* (7720-650-EMP-0006).

Stakeholder engagement is assessed separately for the requirements of the activities. Ongoing stakeholder management strategies are discussed in Section 8.12.

## 8.1 Environmental Management System

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 22(2). Environmental management system** |
| The implementation strategy must contain a description of the environmental management system for the activity, including specific measures to be used to ensure that, for the duration of the activity:<br>(a) the environmental impacts and risks of the activity continue to be identified and reduced to a level that is as low as reasonably practicable; and<br>(b) control measures detailed in the environment plan are effective in reducing the environmental impacts and risks of the activity to as low as reasonably practicable and an acceptable level; and<br>(c) environmental performance outcomes and standards set out in the environment plan are being met. |

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

- a common health, safety and environment (HSE) approach is followed across the organisation
- HSE is proactively managed and maintained
- the mandatory requirements of HSE management are implemented and are auditable
- HSE management performance is measured, and corrective actions are taken
- opportunities for improvement are recognised and implemented
- workforce commitments are understood and demonstrated.
- This implementation strategy is designed to meet the requirements of the EP to require that:
- environmental impacts and risks continue to be identified for the duration of the activity and reduced to ALARP
- control measures are effective in reducing environmental impacts and risks to ALARP and acceptable levels
- environmental performance outcomes and standards set out in this EP are met
- stakeholder consultation is maintained throughout the activity as appropriate.

## 8.2 Environment Policy

Santos' Environment Policy (Appendix A) clearly sets out Santos' strategic environmental objectives and the commitment of the management team to continuous environmental performance improvement. This EP has been prepared in accordance with the fundamentals of this policy. By accepting employment with Santos, each employee and contractor is made aware during the recruitment process that he or she is responsible for the application of this policy.

## 8.3 Hazard Identification, Risk and Impact Assessment and Controls

Hazards and associated environmental risks and impacts for the proposed activities have been systematically identified and assessed in this EP (see Sections 6 and 7). The control measures and EPS that will be implemented

to manage the identified risks and impacts, and the environmental performance outcomes that will be achieved, are detailed below in Table 8-2.

To ensure that environmental risks and impacts remain acceptable and ALARP during the activity and for the duration of this EP, hazards will continue to be identified, assessed and controlled as described in Sections 8.10 and 8.11.

Any new or proposed amendment to a control measure, EPS or EPO will be managed in accordance with the *Environment Management of Change Procedure* (Section 8.10.2).

Oil spill response control measures and environmental performance standards and outcomes are listed in the *Bedout Multi-Well Exploration and Appraisal Drilling OPEP* (7720-650-EMP-0006).

## 8.4 Environmental Performance Outcomes

| OPGGS(E)R 2023 Requirements |
|---|
| **Section21(7). Environmental performance outcomes and standards** |
| The environment plan must:<br>a) set environmental performance standards for the control measures identified under paragraph (5)(c); and<br>b) set out the environmental performance outcomes against which the performance of the titleholder in protecting the environment is to be measured; and<br>c) include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met. |

To ensure environmental risks and impacts will be of an acceptable level, environmental performance outcomes for this EP have been defined and are listed in Table 8-1 for planned activities and unplanned events, those relating to oil spill response are listed in the *Bedout Multi-Well Exploration and Appraisal Drilling OPEP* (7720-650-EMP-0006). These outcomes will be achieved by implementing the identified control measures to the defined environmental performance standards.

**Table 8-1: Environmental Performance Outcomes**

| Reference | Environmental Performance Outcomes |
|---|---|
| BB-EPO-01 | Reduce impacts on other marine users through the provisions of information to relevant stakeholders such that they can plan for their activities and avoid unexpected interference |
| BB-EPO-02 | Seabed disturbance is limited to planned activities and defined locations within the OAs |
| BB-EPO-03 | Do not displace marine turtles from habitat critical to the survival of the species or disrupt biologically important behaviours from occurring within BIAs |
| BB-EPO-04 | Reduce impacts to marine fauna from lighting on vessels and MODU through limiting lighting to that required by safety and navigational lighting requirements |
| BB-EPO-05 | No injury or mortality to EPBC Act and WA BC Act listed marine fauna during activities |
| BB-EPO-06 | No unplanned objects, emissions or discharges to sea or air |
| BB-EPO-07 | Reduce impacts to air and water quality from planned discharges and emissions from the activities |
| BB-EPO-08 | Reduce impacts to water quality from activity vessel discharges by maintaining discharge streams in accordance with standard maritime practices |
| BB-EPO-09 | No introduction of marine pest species |
| BB-EPO-10 | No loss of containment of hydrocarbon to the marine environment |

### 8.4.1 Control Measures and Performance Standards

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

**Table 8-2: Control Measures and Environmental Performance Standards for the Proposed Activity (Environment Plan)**

| Control Measure | CM Reference | Environmental Performance Standard | EPS Reference No. | Measurement Criteria | EPO Reference |
|---|---|---|---|---|---|
| Maritime Notices | BB-CM-01 | Information provided to either AMSA, AHO and/or nearest port authority on MODU arrival and departure so that the maritime industry is aware of petroleum activities. | BB-CM-01-EPS-01 | Transmittal records demonstrate notification of activity prior to the activity commencing. | BB-EPO-01<br>BB-EPO-10 |
| Santos relevant persons consultation strategy | BB-CM-02 | Santos will notify all relevant persons listed, or as revised, in the Stakeholder Register- that have been requested to be notified as specified in the EP of relevant activity details prior to commencement, including activity timing, vessel movements, proposed cessation date and vessel details. | BB-CM-02-EPS-01 | Santos correspondence to relevant stakeholders. | BB-EPO-01<br>BB-EPO-10 |
| | | If the MODU departs and returns from the OAs, relevant maritime notices will be updated. | BB-CM-02-EPS-02 | Santos correspondence to relevant stakeholders. | |
| | | All correspondence with external stakeholders is recorded. | BB-CM-02-EPS-03 | Saved consultation records. | |
| | | Santos' Consultation Coordinator is contactable before, during and after completion of the planned activity to ensure stakeholder feedback is evaluated and considered during the operational activity phases. | BB-CM-02-EPS-04 | Consultation Coordinator contact details provided to relevant persons in all correspondence. | |
| | | Ongoing engagement with Relevant Persons throughout the acceptance period | BB-CM-02-EPS-05 | Santos correspondence to relevant stakeholders. | |
| Petroleum Safety Zone (500 m) and Cautionary Zone (2,000 m) established | BB-CM-03 | A 500 m PSZ and 2,000 m Cautionary Zone are defined around the MODU during the activity and anchor handling activities. | BB-CM-03-EPS-01 | Notice to Mariners placed with AHO outlining PSZ and Cautionary Zone and time frames of the activity. | BB-EPO-01<br>BB-EPO-10 |
| MODU identification system | BB-CM-04 | MODU has an Automatic Identification System (AIS) to aid in its detection at sea. | BB-CM-04-EPS-01 | Noted in inspection report or statement of conformance supplied by MODU contractor | BB-EPO-01<br>BB-EPO-10 |
| No fishing from MODU or support vessels | BB-CM-05 | Personnel are prohibited from recreational fishing activities on MODU or support vessels. | BB-CM-05-EPS-01 | Induction records confirm no fishing prohibition is communicated to all personnel. | BB-EPO-01 |
| Support vessel | BB-CM-06 | At least one support vessel is available at all times to monitor the MODU 500 m exclusion zone to identify approaching third-party vessels and communicate with the vessels. | BB-CM-06-EPS-01 | Daily vessel report demonstrates vessel was present at all times to undertake monitoring duties | BB-EPO-01 |
| | | Support vessel will be equipped with an automatic identification system (AIS) and radar. | BB-CM-06-EPS-02 | Completed inspection report or statement of conformance from vessel contractor. | |
| | | Monitoring of surrounding marine environment is undertaken from vessel bridge. | BB-CM-06-EPS-03 | Bridge log or completed inspection checklist | |
| Lighting will be used as required for safe work conditions and navigational purposes | BB-CM-07 | Vessel/MODU navigation lighting and equipment is compliant with COLREGS/Marine Orders 30: Prevention of Collisions, and with Marine Orders 21: Safety of Navigation and Emergency Procedures. | BB-CM-07-EPS-01 | Vessel certification confirms compliance with applicable regulations. | BB-EPO-01<br>BB-EPO-04<br>BB-EPO-10 |
| Seafarer certification | BB-CM-08 | Vessel crew are trained and competent, in accordance with Flag State regulations, to navigate vessels | BB-CM-08-EPS-01 | Training records | BB-EPO-01<br>BB-EPO-10 |
| Constant bridge-watch (visual and radar) | BB-CM-09 | Competent crew shall maintain constant bridge-watch. | BB-CM-09-EPS-01 | Vessel log of times and persons on watch and / or crew training records and completed vessel statement of conformance. | BB-EPO-01 |
| | | A visual and radar watch will be maintained on the vessel bridge at all times. | BB-CM-09-EPS-02 | Vessel log or times and persons on watch | |
| Pre-lay anchors are marked with surface buoys when semi-submersible MODU is not connected | BB-CM-10 | Pre-lay anchors marked with surface buoys when MODU is not moored. | BB-CM-10-EPS-01 | Compliance documentation for MODU move procedure | BB-EPO-01 |
| Marine assurance standard | BB-CM-11 | Vessels selected and on-boarded in accordance with the Santos Marine Technical Standard to ensure contracted vessels are operated, maintained and manned in accordance with industry standards (for example, Marine Orders) and regulatory requirements (this EP) and the relevant Santos procedures mentioned in this EP. | BB-CM-11-EPS-01 | Completed documentation demonstrates adherence to procedure requirements. | BB-EPO-01<br>BB-EPO-05<br>BB-EPO-06<br>BB-EPO-09<br>BB-EPO-10 |
| MODU move procedure | BB-CM-12 | MODU move procedure contains a passage plan. No accidental contact with the seabed or subsea infrastructure (e.g. submarine telecommunications cables) during the MODU move. | BB-CM-12-EPS-01 | MODU move procedure<br>Details contained in incident documents | BB-EPO-01<br>BB-EPO-02<br>BB-EPO-03 |
| Work with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel/Bancroft and Curie OAs | BB-CM-13 | Alternative, existing fairways used during drilling activities within a shipping fairway (Curie and Mestrel/Bancroft)<br>Information provided to AHO/AMSA to inform Notice to Mariners (e.g. alternative fairway locations and timeframes of the Activity)<br>Implement the requirements of the vessel traffic management plan | BB-CM-13-EPS-01 | Transmittal records demonstrate notification of activity prior to the activity commencing.<br>Completed documentation demonstrates procedure requirements. | BB-EPO-01<br>BB-EPO-09 |

| Control Measure | CM Reference | Environmental Performance Standard | EPS Reference No. | Measurement Criteria | EPO Reference |
|---|---|---|---|---|---|
| If drilling in a shipping fairway MODU Racon Unit installed prior to MODU arrival | BB-CM-14 | A Racon Unit will be installed and working on the MODU prior to its location within any operational area that intersects a shipping fairway. | BB-CM-14-EPS-01 | Installation Evidence | BB-EPO-01 |
| If drilling in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to electronic navigation systems (once license obtained) | BB-CM-15 | An AIS aid to Navigation will be installed and working on the MODU prior to its location within any operational area that intersects a shipping fairway. | BB-CM-15-EPS-01 | Installation Evidence | BB-EPO-01<br>BB-EPO-09 |
| For drilling activities within a shipping fairway, a support vessel is able to act in the capacity of a guard vessel during the activity, to reduce potential for collision or interference with other marine users | BB-CM-16 | Guard vessel<br>• is available at all times to monitor the MODU 500 m Petroleum Safety Zone to identify approaching third-party vessels and communicate with the vessels to ward off potential for collision with the MODU<br>• equipped with an automatic identification system (AIS) and radar; and<br>• Will monitor surrounding marine environment from vessel bridge. | BB-CM-16-EPS-01 | Daily vessel report<br>Daily reports and Vessel AIS records demonstrate a vessel was in place at all times to monitor the MODU 500 m Petroleum Safety Zone. | BB-EPO-01<br>BB-EPO-09 |
| Adaptive Management Plan/Vessel traffic management plan for when drilling within a shipping fairway | BB-CM-17 | Implement the requirements of the Vessel traffic management plan | BB-CM-17-EPS-01 | The Adaptive Management Plan/Vessel Traffic Management Plan will be signed off for use prior to any activities in an operational area that intersect shipping fairways<br>Transmittal records demonstrate notification of activity prior to the activity commencing.<br>Completed documentation demonstrates procedure requirements. | BB-EPO-01<br>BB-EPO-09 |
| MODU station keeping system (semi-sub) | BB-CM-18 | MODU station keeping system maintains the MODU at the desired location. | BB-CM-18-EPS-01 | No station keeping incidence recorded | BB-EPO-02<br>BB-EPO-03 |
| | | Anchors positioned and maintained at locations defined in the rig mooring analysis to reduce risks to seabed habitat | BB-CM-18-EPS-02 | Completed mooring report | |
| | | All parts of the (pre-laid) MODU mooring system deployed to sea are recovered within 3 months of MODU departure to mitigate consequences from objects remaining in the marine environment | BB-CM-18-EPS-03 | Mooring recovery recorded in an operational report | |
| Recovery of all deployed equipment (including pre-lay equipment and anchors) | BB-CM-19 | All equipment deployed during any activity will be recovered. | BB-CM-19-EPS-01 | Survey records | BB-EPO-02<br>BB-EPO-03 |
| Anchoring | BB-CM-20 | No planned anchoring support vessel(s) within the OA. | BB-CM-20-EPS-01 | Daily vessel reports | BB-EPO-02<br>BB-EPO-03 |
| | | If anchoring or placement of equipment is required vessels will anchor or place equipment on seabed only at Santos preapproved locations. | BB-CM-20-EPS-02 | Incident database records show no anchoring or placement of equipment occurred at non-approved locations | |
| | | Should pre-laying of anchors be selected the anchor pattern will also be pre-set with provision for additional anchors for cyclone preparedness to minimise risk of anchor drag | BB-CM-20-EPS-03 | Completed anchor pattern report. | |
| Site surveys | BB-CM-21 | Site surveys confirm the proposed MODU mooring or jack-up locations are free from seabed features, debris, benthic features and subsea infrastructure. | BB-CM-21-EPS-01 | MODU arrival ROV clearance report confirms the absence of seabed features at MODU mooring/jack-up locations. | BB-EPO-02<br>BB-EPO-03 |
| Cultural Heritage Management | BB-CM-22 | Implement the requirements of the WA Unexpected Finds Protocol. | BB-CM-22-EPS-01 | Compliance register identifies relevant requirements of the Unexpected Finds Procedure for the VI Hub assets in state waters and these are tracked through to compliance. | BB-EPO-02<br>BB-EPO-03 |
| Santos procedure for interacting with marine fauna | BB-CM-23 | Vessels comply with Santos' *Protected Marine Fauna Interaction and Sighting Procedure*, which ensures compliance with Part 8 of the EPBC Regulations 2000, which includes controls for minimising the risk of interaction with marine fauna. | BB-CM-23-EPS-01 | Conformance checked on receipt of marine fauna sighting datasheets. | BB-EPO-05 |
| | | | | Completed vessel statement of conformance. | |
| | | Any vessel strikes with cetaceans will be reported in the National Ship Strike Database. | BB-CM-23-EPS-02 | Completed vessel statement of conformance | |
| | | Helicopter contractor procedures comply with Santos' *Protected Marine Fauna Interaction and Sighting Procedure*, which ensures compliance with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000, which includes controls for minimising interaction with marine fauna. | BB-CM-23-EPS-03 | Helicopter contractor procedures align with Santos' Protected Marine Fauna Interaction and Sighting Procedure. | |
| MODU planned maintenance system | BB-CM-24 | Documented maintenance program is in place for equipment on MODU that provides a status on the maintenance of equipment. | BB-CM-24-EPS-01 | Vessel daily/weekly records | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-07<br>BB-EPO-10 |
| | | | | Computerised Maintenance Management System (CMMS) records | |
| | | | | Vessel contractor written verification demonstrates compliance with PMS. | |

| Control Measure | CM Reference | Environmental Performance Standard | EPS Reference No. | Measurement Criteria | EPO Reference |
|---|---|---|---|---|---|
| Vessel planned maintenance system to maintain vessel DP, engines and machinery. | BB-CM-25 | Documented maintenance program is in place for equipment on vessels that provides a status on the maintenance of equipment. | BB-CM-25-EPS-01 | Vessel daily/weekly records<br>IMCA common marine inspection document (CMID)<br>Vessel contractor written verification demonstrates compliance with PMS<br>CMMS records | BB-EPO-05<br>BB-EPO-06<br>BBEPO-07<br>BB-EPO-10 |
| Vessel bridge crew receive induction in marine fauna observations and marine fauna interaction requirements | BB-CM-26 | All vessel bridge crew complete project specific HSE induction that includes information and requirements relating to marine fauna observations and reporting requirements, such that vessel crew will be competent to:<br>• observe marine fauna that are potentially approaching the vessel<br>• complete marine fauna observation reporting requirements as required by the Santos procedure for interacting with marine fauna, Part 8 of the EPBC Regulations 2000 and the National Ship Strike Database. | BB-CM-26-EPS-01 | Induction records demonstrate that bridge crew were inducted on the requirements of the Santos *Protected marine fauna interaction and sighting Procedure* (EA91-11-00003) | BB-EPO-05 |
| VAP procedures | BB-CM-27 | VAP survey implemented which includes controls that reduce the risk of harm to cetaceans, whale sharks and turtles (defined as marine fauna below). The checklist includes the following standards:<br>• A trained crew member observing for marine fauna during daylight.<br>• Soft start procedures enacted over 30 minutes (where equipment allows).<br>• Continuous operations providing no marine fauna within 1 km of the MODU during soft start.<br>• Shut down procedures enacted if marine fauna within 500 m of the MODU during continuous operations.<br>• Daylight operations continue into night providing no more than three marine fauna shut downs in the last 24 hours.<br>• Night start-up using soft start procedures providing no more than three marine fauna shut downs in the last 24 hours or providing at least 2 hours of daylight observations within the last 24 hours and no marine fauna within 1 km of the MODU.<br>Prior to conducting Vertical Acoustic Profiling (VAP), a fauna observation period will be undertaken by a crew member on the MODU who has received training in spotting and reporting of marine fauna.<br>• This will be performed for a minimum of 30 minutes within 3 hours of the (VAP) commencing.<br>• Any nearby support vessels will also be asked to report any marine fauna sightings at this time. | BB-CM-27-EPS-01 | Completed checklist<br>Completed marine fauna sighting register | BB-EPO-05 |
| Waste incineration procedures | BB-CM-28 | Waste incineration managed in accordance with MARPOL Annex VI, except incineration within the 500-m exclusion zone shall not occur. | BB-CM-28-EPS-01 | Completed waste record book or recording system | BB-EPO-06<br>BB-EPO-07 |
| Fuel oil quality | BB-CM-29 | MARPOL-compliant fuel oil will be used during the activity.<br>Intermediate fuel oil or heavy fuel oil will not be used during the activity. | BB-CM-29-EPS-01 | Fuel bunkering records | BB-EPO-06<br>BB-EPO-07<br>BB-EPO-10 |
| International Air pollution prevention certification | BB-CM-30 | Pursuant to MARPOL Annex VI, MODU and support vessel(s) will maintain a current International Air Pollution Prevention (IAPP) Certificate which certifies that measures to prevent ozone-depleting substance (ODS) emissions, and reduce NOx, Sox and incineration emissions during the activity are in place. | BB-CM-30-EPS-01 | Current IAPP certificate | BB-EPO-06<br>BB-EPO-07 |
| Ozone-depleting substance handling procedures | BB-CM-31 | Ozone-depleting substances (ODS) managed in accordance with MARPOL Annex VI to reduce the risk of an accidental release of ODS to air. | BB-CM-31-EPS-01 | Completed ODS record book for recording system. | BB-EPO-06<br>BB-EPO-07 |
| Well test procedures<br>• reduce well flowback to minimum required.<br>• utilise high efficiency burner heads. | BB-CM-32 | NOPSEMA accepted MODU Safety Case Revision for well testing includes control measures that reduce the risk of hydrocarbons from entering the marine environment. | BB-CM-32-EPS-01 | NOPSEMA-accepted safety case revision for well testing. | BB-EPO-02<br>BB-EPO-06<br>BB-EPO-07<br>BB-EPO-10 |
| | | Santos Well Test Program checklists completed to ensure safety and environmental control measures are implemented. | BB-CM-32-EPS-02 | Completed well test program checklist. | |
| | | Burner pilots to remain ignited during a well test to reduce the risk of hydrocarbons being released to sea and air. | BB-CM-32-EPS-03 | Incident report of flare drop-out. | |
| | | Burner monitored by a dedicated flare watcher during a well test to identity and communicate an unplanned flare drop-out. | BB-CM-32-EPS-04 | Incident report of flare drop-out. | |

| Control Measure | CM Reference | Environmental Performance Standard | EPS Reference No. | Measurement Criteria | EPO Reference |
|---|---|---|---|---|---|
| | | In the event of a flare drop-out or hydrocarbon being observed on the sea surface then liquid flaring, and if applicable the well test, shall cease and the event investigated and corrected before proceeding. | BB-CM-32-EPS-05 | Incident report of flare drop-out or unplanned hydrocarbon release | |
| | | During a well test, formation water and completion fluids containing hydrocarbons must be:<br>• flared with hydrocarbons, or<br>• stored in tanks on-board and shipped ashore for disposal, or<br>• treated through an oil-water filtration system to reduce the oil in water to 1% v/v concentration before being disposed to sea. | BB-CM-32-EPS-06 | Completed operational reports. | |
| | | Oil-water filtration equipment will be:<br>• designed to reduce oil-in-water to <1% by volume<br>• calibrated prior to use<br>• oil-in-water content monitored to assess the performance of the filtration equipment. | BB-CM-32-EPS-07 | Completed operational reports. | |
| Monitoring of support vessel fuel consumption | BB-CM-33 | Daily vessel fuel use monitoring | BB-CM-33-EPS-01 | Fuel use monitoring recorded in daily vessel performance reports | BB-EPO-06<br>BB-EPO-07 |
| Waste (garbage) management procedure | BB-CM-34 | No waste (garbage) discharged to sea, unless the waste is food waste disposed in accordance with MARPOL Annex V. | BB-CM-34-EPS-01 | Completed garbage disposal record book or recording system. | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-08 |
| | | Pursuant to MARPOL Annex V, placards displayed to notify personnel of waste disposal restrictions. | BB-CM-34-EPS-02 | Completed inspection checklist | |
| Deck cleaning product selection | BB-CM-35 | Deck cleaning products planned to be released to sea meet the criteria for not being harmful to the marine environment according to MARPOL Annex V. | BB-CM-35-EPS-01 | SDS and product supplier supplementary data as required.<br>Completed inspection checklist. | BB-EPO-06<br>BB-EPO-08 |
| General chemical management procedures | BB-CM-36 | SDS available for all chemicals to aid in the process of hazard identification and chemical management. | BB-CM-36-EPS-01 | Completed inspection checklist | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-08 |
| | | Chemicals managed in accordance with SDS in relation to safe handling and storage, spill response and emergency procedures, and disposal considerations. | BB-CM-36-EPS-02 | Completed inspection checklist | |
| Chemical selection procedure | BB-CM-37 | Chemicals planned for discharge to sea from the MODU and vessels are risk assessed as per the *Santos Offshore Division Drilling Chemical Selection and Approval Process*. This includes chemicals used in potable water systems. | BB-CM-37-EPS-01 | Completed Santos risk assessment. | BB-EPO-02<br>BB-EPO-05<br>BB-EPO-06<br>BB-EPO-07<br>BB-EPO-08<br>BB-EPO-10 |
| | | Drilling, completions and cement chemicals potentially discharged to sea are Gold/Silver/D or E rated through OCNS, or PLONOR substances listed by OSPAR, or have a complete risk assessment as per *Santos' Offshore Division Drilling Chemical Selection and Approval Process* so that only environmentally acceptable products are used. | BB-CM-37-EPS-02 | Completed Santos risk assessment. | |
| | | Firefighting foam on board the MODU and vessels will not be discharged to sea during testing of the firefighting system. | BB-CM-37-EPS-03 | Fire system test records | |
| Sewage treatment system | BB-CM-38 | Pursuant to MARPOL Annex VI, MODU and support vessel(s) have a current International Sewage Pollution Prevention (ISPP) Certificate which certifies that required measures to reduce impacts from sewage disposal are in place. | BB-CM-38-EPS-01 | Current ISPP certificate | BB-EPO-06<br>BB-EPO-08 |
| | | Sewage discharged in accordance with MARPOL Annex IV. | BB-CM-38-EPS-02 | Completed inspection checklist | |
| | | Preventive maintenance on sewage treatment equipment is completed as scheduled. | BB-CM-38-EPS-03 | Maintenance records | |
| Oily water treatment system | BB-CM-39 | Oily mixtures (bilge water) only discharged to sea in accordance with MARPOL Annex I. | BB-CM-39-EPS-01 | Completed inspection checklist<br>Oil record book or log | BB-EPO-06<br>BB-EPO-08 |
| | | Preventative maintenance on oil filtering equipment completed as scheduled. | BB-CM-39-EPS-02 | Completed inspection checklist<br>Oil record book or log | |
| | | Pursuant to MARPOL Annex I, a MODU and support vessel(s) will have an International Oil Pollution Prevention (IOPP) Certificate which certifies that required measures to reduce impacts of planned oil discharges are in place. | BB-CM-39-EPS-03 | Current IOPP certificate | |
| Cuttings Management System | BB-CM-40 | All well returns to the MODU are diverted to shale shakers, except if drilling with seawater. The recovered drilling fluid is recycled to the mud pits and separated drilled cuttings/solids diverted overboard. If drilling with seawater, cuttings/solids returned to the MODU are diverted overboard. | BB-CM-40-EPS-01 | Daily Mud Report | BB-EPO-02<br>BB-EPO-06<br>BB-EPO-07 |
| | | The shale shakers are fitted with screens that meet API standards for solids removal particle size cut points. | BB-CM-40-EPS-02 | Inspection records | |

| Control Measure | CM Reference | Environmental Performance Standard | EPS Reference No. | Measurement Criteria | EPO Reference |
|---|---|---|---|---|---|
| | | Centrifuges are used as required to remove additional finer drilled cuttings/solids that are too small for the shale shakers to remove. | BB-CM-40-EPS-03 | Daily Mud Report | |
| | | Shale shakers are inspected by a dedicated shale shaker hand while drilling to ensure:<br>• shakers are running and screens vibrating<br>• shaker screens are not damaged or blinding. | BB-CM-40-EPS-04 | Daily Mud Report | |
| Inventory control procedure | BB-CM-41 | Only residual water-based fluid systems, brine, completion chemicals, cement and cement spacer within MODU mud pits and surface tanks that is no longer required will diverted overboard. | BB-CM-41-EPS-01 | End of well report | BB-EPO-02<br>BB-EPO-06<br>BB-EPO-07 |
| Decision list for managing bulk powders remaining on the MODU at the end of the drilling campaign. | BB-CM-42 | Decision criteria for remaining bulk products, in order of priority:<br>• retain<br>• sell<br>• minimise<br>• transfer to alternative MODU (Overboard disposal of stock; stock will be discharged as wet slurry) | BB-CM-42-EPS-01 | Decision record for management of residual bulk powders | BB-EPO-02<br>BB-EPO-06<br>BB-EPO-07 |
| Quality control limits for Barite | BB-CM-44 | Contaminant limit concentrations in barite:<br>• Mercury (Hg) – 1 mg/kg dry weight in stock barite<br>• Cadmium (Cd) – 3 mg/kg dry weight in stock barite<br>Puts a limit on the contaminants within the barite, therefore reducing sediment contamination as a result of cuttings discharge or any future cuttings disturbance. | BB-CM-44-EPS-01 | Analysis certificates and records show barite used for the drilling meets the below standard:<br>• Mercury (Hg) – 1 mg/kg dry weight in stock barite<br>• Cadmium (Cd) – 3 mg/kg dry weight in stock barite | BB-EPO-02<br>BB-EPO-06<br>BB-EPO-07 |
| | | All barite is selected in accordance with API specifications which has limitations on all contaminant concentrations. | BB-CM-44-EPS-02 | Mud reports show all mud is API standard | |
| Only WBM will be used to drill the wells | BB-CM-45 | Only WBM will be used to drill the wells | BB-CM-45-EPS-01 | Mud reports show all mud is WBM | BB-EPO-02<br>BB-EPO-06<br>BB-EPO-07 |
| Dropped object prevention procedures | BB-CM-46 | MODU Safety Case includes the following control measures for dropped objects that reduce the risk of objects entering the marine environment:<br>• lifting equipment certification and inspection;<br>• lifting crew competencies;<br>• heavy-lift procedures; and<br>• preventive maintenance on cranes. | BB-CM-46-EPS-01 | • NOPSEMA-accepted Safety Case<br>• completed inspection checklist<br>• details contained in incident documents | BB-EPO-05<br>BB-EPO-06 |
| | | Lifting operations managed in accordance with MODU work instructions or procedures | BB-CM-46-EPS-02 | MODU work instructions or procedures | |
| | | MODU objects dropped overboard are recovered to mitigate the environmental consequences from objects remaining in the marine environment, unless the environmental consequence is negligible, or safety risks are disproportionate to the environmental consequences. | BB-CM-46-EPS-03 | Fate of dropped objects detailed in incident documents | |
| Hazardous chemical management procedures | BB-CM-47 | For hazardous chemicals including hydrocarbons, the following standards apply to reduce the risk of an accidental release to sea:<br>• storage containers closed when the product is not being used;<br>• storage containers managed in a manner that provides for secondary containment in the event of a spill or leak;<br>• storage containers labelled with the technical product name as per the safety data sheet (SDS);<br>• spills and leaks to deck, excluding storage bunds and drip trays, immediately cleaned up;<br>• storage bunds and drip trays do not contain free flowing volumes of liquid; and<br>• spill response equipment readily available. | BB-CM-47-EPS-01 | Completed inspection checklist | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| International Maritime Dangerous Goods Code | BB-CM-48 | Dangerous goods managed in accordance with International Maritime Dangerous Goods Code (IMDG Code) to reduce the risk of an environmental incident, such as an accidental release to sea or unintended chemical reaction. | BB-CM-48-EPS-01 | • Completed multimodal dangerous goods form<br>completed inspection checklist | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| Implementation of the management controls in the Santos Invasive Marine Species Management Plan (IMSMP) | BB-CM-49 | MODU and vessels are managed to low risk in accordance with the *Santos WA Invasive Marine Species Management Plan* prior to movement or transit into or within the invasive marine species management zone, which requires:<br>• assessment of applicable vessels using the IMSMP risk assessment | BB-CM-49-EPS-01 | • Completed vessel check report demonstrating MODU, equipment and vessels are ‘low risk’ | BB-EPO-09 |

| Control Measure | CM Reference | Environmental Performance Standard | EPS Reference No. | Measurement Criteria | EPO Reference |
|---|---|---|---|---|---|
| | | • the management of immersible equipment to low risk. | | | |
| | | Pursuant to the *Biosecurity Act 2015* (and 2021 Regulations) and Australian Ballast Water Management Requirements, support vessels carrying ballast water and engaged in international voyages shall manage ballast water so that marine pest species are not introduced. | BB-CM-49-EPS-02 | Records show Ballast Water Management is implemented.<br>• Completed ballast water record book or log is maintained. | |
| | | Vessel(s) receive entry clearance from DAFF (Seaports) as necessary (or as applicable to their location and movements). | BB-CM-49-EPS-03 | • Records show a complete Questionnaire for Biosecurity Exemptions for Biosecurity Control Determination issued to Seaports at least one month in advance where practicable | |
| Anti-foulant system | BB-CM-50 | Vessel anti-foulant system maintained in compliance with International Convention on the Control of Harmful Anti-fouling Systems on Ships. | BB-CM-50-EPS-01 | • Current International Anti-Fouling System Certificate. | BB-EPO-09 |
| MODU and support vessel spill response plans | BB-CM-51 | MODU and support vessel have and implement a Shipboard Oil Pollution Emergency Plan (SOPEP), or Shipboard Marine Pollution Emergency Plan (SMPEP), pursuant to MARPOL Annex I. | BB-CM-51-EPS-01 | • Approved SOPEP or SMPEP | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| | | SOPEP or SMPEP spill response exercises conducted not less often than every three months to ensure personnel are prepared. | BB-CM-51EPS-02 | • Spill exercise records or evidence of a spill exercise in an operational report | |
| Bulk solid transfer procedure | BB-CM-52 | Bulk solids transferred in accordance with bulk transfer procedures to reduce the risk of an unintentional release to sea. The procedures includes standards for:<br>• hose integrity: certified hoses will be used<br>• hose flotation: bulk hoses in the water fitted with floatation collars<br>• valve alignment: a MODU supervisor checks that all valves are lined up correctly<br>• communications: constant radio communications between MODU control room and vessel<br>• inventory control: MODU control room monitors tank fill levels or air vents watched to detect tank overfill<br>• emergency shutdown available and tested before each transfer operation. | BB-CM-52-EPS-01 | • Completed procedural documents, for example work permits, job safety analysis forms, checklists, etc.<br>• Spill details contained in incident documentation. | BB-EPO-06 |
| Bulk liquid transfer procedure | BB-CM-53 | Bulk liquids transferred in accordance with the bulk transfer procedure to reduce the risk of a release to sea. The procedures will require:<br>• hose integrity: certified hoses inspected prior to use and are replaced after 12 months of use, except for drill water and brine hoses which shall be replaced after 24 months of use;<br>• hose flotation: bulk hoses in the water fitted with floatation collars;<br>• hose connections: hoses used for hydrocarbons fitted with hammer union connections at the MODU's manifold, self-sealing (dry-break) connections at the vessel end and self-sealing break-away connections when two or more hoses are joined together;<br>• valve alignment: a MODU supervisor checks that all valves are lined up correctly;<br>• tank venting: air vents for hydrocarbon storage tanks bunded if there is a risk of spill to deck;<br>• supervision: dedicated hose watch person while pumping bulk hydrocarbons;<br>• communications: constant radio communications between MODU control room and vessel;<br>• inventory control: MODU control room monitors tank fill levels; and<br>• emergency shutdown available and tested before each transfer operation. | BB-CM-53-EPS-01 | • completed procedural documents, for example work permits, job safety analysis forms, checklists, etc.<br>• spill details contained in incident documentation | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| Drilling and Completions Management Process | BB-CM-54 | Regulator accepted Well Operations Management Plan (WOMP) includes control measures for well integrity that reduce the risk of an unplanned release of hydrocarbons. | BB-CM-54-EPS-01 | Regulator-accepted WOMP. | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| | | Regulator accepted MODU Safety Case includes control measures for well control that reduce the risk of an unplanned release of hydrocarbons. | BB-CM-54-EPS-02 | Regulator-accepted Safety Case. | |
| | | Santos Critical Acceptance Criteria for critical well operations and integrity aspects are achieved. Critical Acceptance Criteria will be selected based on the well objectives and Santos' Drilling and Completions Management Process technical standards, being:<br>• location<br>• well control equipment<br>• well barriers<br>• drilling and completions fluids | BB-CM-54-EPS-03 | Completed Critical Acceptance Criteria (CAC) in well program | |

| Control Measure | CM Reference | Environmental Performance Standard | EPS Reference No. | Measurement Criteria | EPO Reference |
|---|---|---|---|---|---|
| | | • surveying and trajectory control<br>• casing, liner and tubing<br>• cement<br>• wellhead and production trees<br>• completion components. | | | |
| Accepted OPEP | BB-CM-55 | In the event of an oil spill to sea, the Santos OPEP requirements are implemented to mitigate environmental impacts. | BB-CM-55-EPS-01 | Completed incident documentation. | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| Pre-campaign commencement assurance check | BB-CM-56 | Prior to each campaign commencement, an assurance check will be undertaken in accordance with *Santos Environment Management of Change Procedure* (Noting that a pre-campaign check will not be required prior to the first campaign under this EP if it is commenced within 12 months of EP acceptance). | BB-CM-56-EPS-01 | Completed Assurance Check form. | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| Predrilling source control plan | BB-CM-57 | Prior to the drilling there will be a source control plan in place. | BB-CM-57-EPS-01 | Source control plan | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| Pore pressure modelling assured by an Independent Subject Matter Expert (SME) and/or Technical Authority | BB-CM-58 | Santos to engage Independent Subject Matter Expert (SME) and/or Technical Authority | BB-CM-58-EPS-01 | External validation report | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| Well Control Bridging Document (WCBD) | BB-CM-59 | Prior to drilling there will be an approved WCBD in place. | BB-CM-59-EPS-01 | Approved WCBD | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| Well control certification | BB-CM-60 | Prior to each campaign commencement, an assurance check will be undertaken to confirm the relevant required personnel hold a current well control certification. Required personnel will be defined within the well control bridging document. | BB-CM-60-EPS-01 | Training records/register | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| Only one MODU will drill into the reservoir at any one time | BB-CM-61 | • Only one MODU is permitted to drill into the reservoir at any one time within the approved campaign scope.<br>• Drilling operations must comply with the approved well sequence and schedule. | BB-CM-61-EPS-01 | • Approved drilling schedule demonstrates only one MODU drills into the reservoir at any one time.<br>• Daily drilling reports confirm compliance with the planned sequence. | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| Where an independent SME and/or technical authority validation of pore pressure modelling identifies discrepancies or uncertainties, Real time pore pressure monitoring will be implemented. | BB-CM-62 | Santos will:<br>• Engage an independent SME and/or technical authority to perform pore pressure modelling validation | BB-CM-62-EPS-01 | • Pore pressure modelling report<br>• Engagement of real time monitoring consultant<br>• Daily Report. | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| ROV inspection and maintenance procedures | BB-CM-63 | Preventative maintenance on ROV completed as scheduled to reduce the risk of hydraulic fluid releases to sea. | BB-CM-63-EPS-01 | Maintenance records or evidence of maintenance in operational reports | BB-EPO-05<br>BB-EPO-06<br>BB-EPO-10 |
| | | ROV pre-deployment inspection completed to reduce the risk of hydraulic fluid releases to sea. | BB-CM-63-EPS-02 | Completed pre-deployment inspection checklist | |
| Actively pursue regular meetings with AMSA to progress planning and implementation of modification of shipping fairways in Bedout basin, to drill wells located in shipping fairways – throughout the life of this EP | BB-CM-64 | Regular meetings with AMSA on a monthly, quarterly or as needed basis to progress shipping fairway modifications.<br>Meetings to include progress updates on activity execution and plan for upcoming notifications. | BB-CM-64-EPS-01 | Meeting minutes | BB-EPO-01<br>BB-EPO-09 |
| Monitoring of mooring equipment | BB-CM-65 | Mooring equipment will be subject to ongoing monitoring throughout operations, to ensure it remains in place to minimise seabed disturbance and maintain operational safety.<br>Data is captured continuously via bridge. | BB-CM-65-EPS-01 | Completed monitoring checklist<br>No unplanned anchor movements | BB-EPO-02<br>BB-EPO-03 |
| Actively engage with AHO on proposal to modify shipping fairways for safe navigation, when drilling within the Bedout basin. | BB-CM-66 | Meetings to include progress updates on activity execution and plan for upcoming notifications. | BB-CM-66-EPS-01 | Meeting minutes and action register | BB-EPO-01<br>BB-EPO-09 |

## 8.5 Roles and Responsibilities

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 22(3) Implementation Strategy for the Environment Plan** |
| The implementation strategy must establish a clear chain of command, setting out the roles and responsibilities of personnel in relation to the implementation, management, and review of the environment plan, including during emergencies or potential emergencies. |

While the Santos Chief Executive Officer (CEO) has the overall accountability for the implementation of the Santos Management System and Santos Environment Policy, the Bedout assets sits under the remit of the Executive Vice President of WA, Northern Australia, Timor Leste Business Unit. The Santos General Manager – Drilling and Completions and Decommissioning is accountable for ensuring implementation, management, and review of this Bedout Multi-Well Exploration and Appraisal Drilling EP. Key roles and environmental responsibilities for the activity are detailed in Table 8-3 and will be communicated to these positions before the activity commences and when any changes are made to these positions.

**Table 8-3: Chain of command, key leadership roles and responsibilities**

| Role | Responsibilities |
|---|---|
| General Manager – Drilling and Completions and Decommissioning | • ensures Santos' policies and standards are adhered to and communicated to all employees and contractors<br>• promotes HSE as a core value integral with how Santos does its business<br>• empowers personnel to 'stop-the-job' due to HSE concerns<br>• provides resources for HSE management<br>• ensures a high level of HSE performance and drives improvement opportunities<br>• ensures emergency response plans are in place<br>• maintains communication with company personnel, government agencies and the media<br>• approves MoC documents, if acceptable and ALARP<br>• ensures the annual HSE improvement plan is completed. |
| Santos Drilling Superintendent | • ensures conformance with environmental performance outcomes and standards in the EP<br>• delegates HSE responsibility and informs these personnel of their responsibilities under the EP<br>• empowers personnel to `stop-the-job' due to HSE concerns<br>• ensures HSE incidents are reported, investigated, corrected and communicated<br>• ensures MODU meets quarantine requirements to operate in Australian waters<br>• ensures HSE inspections and audits are completed and corrective actions implemented<br>• reviews MoC documents<br>• ensures personnel on the MODU have the necessary qualifications, training and/or supervision. |
| Santos Supervisors/ MODU Offshore Installation Manager/Vessel Masters | Has overall responsibility for:<br>• implementation and compliance with relevant environmental legislative requirements, EP commitments and operational procedures on the vessel<br>• maintaining clear communication with personnel on board<br>• communicating hazards and risks to the workforce<br>• monitoring daily activities on the vessel/MODU to ensure that the relevant environmental legislative requirements, EP commitments and operational procedures are being followed<br>• maintaining vessels/MODU to all regulatory and class requirements<br>• maintaining their vessel/MODU in a state of preparedness for emergency response<br>• reporting environmental incidents to PIC and ensuring follow-up actions are performed. |
| Company Site Representative | Has responsibility for:<br>• implementing EP commitments<br>• ensuring personnel competency<br>• ensuring compliance with procedures and work instructions<br>• being site focal point for onshore/offshore communications<br>• reporting all incidents and potential hazards<br>• leading site-based incident response |

| Role | Responsibilities |
|---|---|
| | • implementing corrective actions from environmental incidents and audits |
| Environment Approvals Manager | • Ensure adequate resources are in place to meet environment compliance requirements within the EP.<br>• Notify NOPSEMA of a change in titleholder, a change in the titleholder's nominated liaison person or a change in the contact details (as per Section 1.4). Ensure incident preparedness and response arrangements meet Santos and regulatory requirements.<br>• Ensure adequate resources are in place to meet the compliance requirements within the OPEP<br>• Has overall responsibility for approving the OPEP. |
| **Support Personnel** | |
| Santos Marine Superintendent | • Ensures conformance with environmental performance outcomes and standards in the EP delegates HSE responsibility and informs these personnel of their responsibilities under the EP<br>• Empowers personnel to `stop-the-job' due to HSE concerns<br>• Ensures HSE incidents are reported, investigated, corrected and communicated<br>• Ensure vessels meet quarantine requirements to operate in Australian waters<br>• Ensures HSE inspections and audits are completed and corrective actions implemented<br>• Ensures personnel on the vessels have the necessary qualifications, training and/or supervision |
| Santos HS Manager | Has overall responsibility for:<br>• ensuring incident preparedness and response arrangements meet Santos and regulatory requirements<br>• approving the OPEP<br>• providing ongoing resources to maintain compliance with the OPEP and other Santos incident response requirements. |
| Senior Stakeholder Adviser / Relevant Persons Coordinator | • Responsible for implementation of steps described in Section 8.12 relating to post acceptance consultation throughout the duration of the Activity<br>• Maintains a Relevant Persons contact and information database.<br>• Maintains a Relevant Persons Notification Log specific to the EP.<br>• Maintains records of all Relevant Persons correspondence specific to the EP<br>• Ensures relevant stakeholders are identified throughout the life of the EP.<br>• Prior to commencement of the activity and on advice of HSE Team Lead, provides a notification to all relevant stakeholders listed, or as revised, in Table 8-4 and Table 8-6 The notification will include information on activity timing, vessel movements and vessel details.<br>• On advice of Santos Environmental Coordinator (Compliance), provide cessation notifications to relevant stakeholders identified in Table 8-4 and Table 8-6.<br>• Is available before, during and after the activity to ensure opportunities for stakeholders to provide feedback are available.<br>• Prepares and distributes quarterly consultation updates to relevant |
| Santos Environment Risk and Compliance Lead | • Ensure environmental monitoring is conducted in accordance with the Santos Management System and this EP.<br>• Ensure incident investigations are conducted as per Santos Management System.<br>• Ensure EP compliance report that covers environmental performance of the activity in this EP is prepared and submitted to NOPSEMA. |
| Senior Oil Spill Response Advisor | Has overall responsibility for:<br>• providing upfront and ongoing guidance, framework, and direction on preparation of this OPEP<br>• developing and maintaining arrangements and contracts for incident response support from third-parties<br>• developing and defining objectives, strategies and tactical plans for response preparedness defined in this OPEP and IRP<br>• undertaking assurance activities on arrangements outlined within the OPEP. |

# 8.6 Workforce Training and Competency

| OPGGS(E)R 2023 Requirements |
| --- |
| **Section 22(4) Implementation Strategy for the Environment Plan** |
| The implementation strategy must include measures to ensure that each employee or contractor working on, or in connection with, the activity is aware of his or her responsibilities in relation to the environment plan, including during emergencies or potential emergencies, and has the appropriate competencies and training. |

This section describes the mechanisms that will be in place so that each employee and contractor is aware of their responsibilities in relation to the EP and has appropriate training and competencies.

## 8.6.1 Activity Inductions

All personnel on the MODU and vessels will complete an induction that will include a component addressing their EP responsibilities. Induction attendance records for all personnel will be maintained. Inductions will include information on:

- Santos' Environment Policy (Appendix A)
- regulatory regime (NOPSEMA regulations)
- operating environment (e.g. nearby protected marine areas, sensitive environmental periods)
- interaction with other marine users (i.e. topic to reinforce the importance of marine communications regarding any potential interactions with active commercial fishing)
- activities with highest risk (e.g. invasive marine species and hydrocarbon releases)
- EPOs and environmental management measures (e.g. Table 8-1 and Table 8-2)
- Santos Unexpected Finds Protocol
- incident reporting and notifications
- regulatory compliance reporting
- MOC process for changes to EP activities
- oil pollution emergency response (e.g. OPEP requirements).

## 8.6.2 Training and Competency

All members of the workforce on the MODU and vessels will complete relevant training and hold qualifications and certificates for their role. Santos and its contractors are individually responsible for ensuring that their personnel are qualified and trained. The systems, procedures and responsible persons will vary and will be managed through the use of online databases, staff on boarding process and training departments, etc.

Personnel qualification and training records will be sampled before and/or during an activity. Such checks will be performed during the procurement process, facility acceptance testing, inductions, crew change, and operational inspections and audits.

## 8.6.3 Workforce Involvement and Stakeholder Communications

Daily operational meetings will be held at which HSE will be a standing agenda item. It is a requirement that supervisors attend daily operational meetings and that all personnel attend daily toolbox or pre-shift meetings. Toolbox or pre-shift meetings will be held to plan jobs and discuss work tasks, including HSE risks and their controls.

HSE performance will be monitored and reported during the activity, and performance metrics (such as the number of environmental incidents) will be regularly communicated to the workforce. Workforce involvement and environmental awareness will also be promoted by encouraging offshore personnel to report marine fauna sightings and marine pollution (for example, oil on water, dropped objects).

## 8.7 Emergency Preparedness and Response

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 22(8) Implementation Strategy for the Environment Plan** |
| The implementation strategy must contain an oil pollution emergency plan and provide for updating the plan. |

The MODU and vessels are required to have and implement incident response plans, such as an emergency response plan and SMPEP or SOPEP. Regular incident response drills and exercises (for example, as defined in an emergency response plan, SMPEP or SOPEP) are performed to refresh the crew in using equipment and implementing incident response procedures.

Santos will implement the *Bedout Multi-Well Exploration and Appraisal Drilling OPEP* (7720-650-EMP-0006) in the event of a hydrocarbon spill. The OPEP details how Santos will prepare and respond to a spill event and details the arrangements for testing the oil pollution emergency response, in accordance with section 22(12) – (14) of the Regulations.

## 8.8 Incident Reporting, Investigation and Follow Up

| OPGGSR 2023 Requirements |
|---|
| **Section 22(7) Implementation Strategy for the Environment Plan** |
| The implementation strategy must state when the titleholder will report to the Regulator in relation to the titleholder's environmental performance for the activity. The interval between reports will not be more than 12 months. |
| **Section 22(6)** |
| The implementation strategy must provide for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and standards in the environment plan are being met. |
| **Section 22(5)** |
| The implementation strategy must provide for sufficient monitoring, recording, audit, management of non-conformance and review of the titleholder's environmental performance and the implementation strategy to ensure that the environmental performance outcomes and environmental performance standards in the environment plan are being met. |
| **Section 24 Other information in environment plan** |
| The environment plan must contain the following:<br>(c) details of all reportable incidents in relation to the proposed activity |

The requirements for reporting, investigating, and learning from unplanned or uncontrolled events that have or could have resulted in harm to people, the environment or company assets are defined in the Incident Reporting Procedure.

All personnel will be informed through inductions and daily operational meetings of their duty to report HSE incidents and hazards. Reported HSE incidents and hazards will be shared during daily operational meetings and will be documented in Santos' incident management system. HSE incidents will be investigated using root cause analysis.

Environmental recordable and reportable incidents will be reported to NOPSEMA as required, in accordance with Table 8-4.The incident reporting requirements will be provided to all crew on board the MODU and vessels with special attention to the reporting time frames to provide for accurate and timely reporting.

For the purposes of this activity, in accordance with OPGGS(E) Regulations:

- a recordable incident, for an activity, means a breach of an EPO or EPS, in the EP that applies to the activity, that is not a reportable incident
- a reportable incident, for an activity, means an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage.

For the purposes of this EP, a reportable incident is an incident that is assessed to have an environmental consequence of moderate or higher in accordance with the Santos environmental impact and risk assessment process outlined in Section 5. Of the planned and unplanned events assessed within this EP, the following were identified to have a potential consequence level of Moderate or higher if the event were to occur and would therefore be a reportable incident (section 24(c) of the OPGGS(E)R):

- introduction of invasive marine species (Moderate)
- hydrocarbon spill marine diesel oil (Moderate)

- hydrocarbon release from LOWC (Major).

## 8.9 Reporting and Notifications

| OPGGSR 2023 Requirements |
|---|
| **Section22(7) Implementation Strategy for the Environment Plan** |
| The implementation strategy must state when the titleholder will report to the Regulator in relation to the titleholder's environmental performance for the activity. The interval between reports will not be more than 12 months. |
| **Section22(6)** |
| The implementation strategy must provide for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and standards in the environment plan are being met. |

### 8.9.1 Notifications and Compliance Reporting

Regulatory and compliance reporting requirements are summarised in Table 8-4.

Activity notifications requested during consultation or where Santos has standing arrangements are summarised in Table 8-6.

It is noted that whilst spills to bunded areas are not reported as 'recordable' incidents to the Regulator, all spills are recorded into Santos' action tracking management system for record keeping and trend identification purposes.

**Table 8-4: Activity notification and reporting requirements**

| Initiation | Required Information | Timing | Type | Recipient |
|---|---|---|---|---|
| **Before the Activity** | | | | |
| OPGGS(E) Regulation 54 & 55 – Notifications | NOPSEMA must be notified that the activity is to commence | At least ten days before the campaign activity commences. | Written | NOPSEMA |
| AHO | Any modifications to shipping fairways to be communicated to AHO for the purpose of updating navigational charts | Within six months prior to activity execution | Written | AHO |
| **During the Activity** | | | | |
| Australian Marine Mammal Centre Reporting<br>Any ship strike incident with cetaceans will also be reported to the National Ship Strike database. | Ship strike report provided to the Australian Marine Mammal Centre: https://data.marinemammals.gov.au/report/shipstrike. | As soon as practicable. | Written | DCCEEW |
| AMSA Reporting<br>Under the MoU between Santos and AMSA and as requested by AMSA during consultation. | Any changes to the intended operations. | As soon as practicable. | Written | AMSA's JRCC: jrccaus@amsa.gov.au |
| | Titleholder agrees to notify AMSA of any marine pollution incident [1]. | Within two hours of incident. | Oral | AMSA |
| | POLREP and SITREP available online (refer to OPEP). | POLREP as requested by AMSA following verbal notification.<br>SITREP as requested by AMSA within 24 hours of request. | Written | AMSA |
| First Nations groups or Registered Native Title Bodies Corporate (RNTBC) or Prescribed Body Corporates (PBCs) | Notification of spill heading towards relevant parties' interests | Within twelve hours of incident being identified | Oral with follow up email | First Nations groups, RNTBC or PBCs |
| CASA | All strikes will be reported by the helicopter operator to CASA. | As soon as possible | Oral with follow up email | CASA |
| Department of Biodiversity, Conservation and Attractions Reporting<br>Any harm or mortality to fauna listed as threatened under the WA *Biodiversity Conservation Act 2016*. | Notification of any harm or mortality to fauna listed as a threatened species under the WA *Biodiversity Conservation Act 2016* as a result of Santos' activities. | A fauna report will be submitted to DBCA within seven days to fauna@dbca.wa.gov.au. | Written | DBCA |

| Initiation | Required Information | Timing | Type | Recipient |
|---|---|---|---|---|
| Department of Biodiversity, Conservation and Attractions Reporting<br>Notification of the event of a hydrocarbon release. | Notification of actual or impending spillage. | As soon as practicable. | Oral or written | DBCA Pilbara regional office |
| DCCEEW Reporting<br>Any harm or mortality to EPBC Act listed threatened marine fauna.<br>Marine Fauna Sighting Data. | Notification of any harm or mortality to an EPBC listed species of marine fauna whether attributable to the activity or not. | Within seven days to EPBC.permits@environment.gov.au | Written | DCCEEW |
| | Marine fauna sighting data recorded in the marine fauna sighting database. | As soon as practicable, in any case no later than three months of the end of the activity. | Written | DCCEEW |
| DPIRD Reporting<br>If marine pests or disease are suspected this must be reported to DPIRD. | Notification of any suspected marine pests or diseases including any organism listed in the Western Australian Prevention List for Introduced Marine Pests and any other non-endemic organism that demonstrates invasive characteristics. | Within 24 hours. | Oral | DPIRD FishWatch |
| Department of Transport and Major Infrastructure Reporting<br>All actual or impending MOP incidents that are in, or may impact, State waters resulting from an offshore activity. | Notification of actual or impending spillage, release or escape of oil or an oily mixture that is capable of causing loss of life, injury to a person or damage to the health of a person, property or the environment. | Within two hours. | Oral | DTMI |
| | WA DTMI POLREP and SITREP available online (refer OPEP). | As requested by DTMI after verbal notification. | Written | DTMI |
| Director of National Parks Reporting<br>Notification of the event of oil pollution within a marine park or where an oil spill response action must be taken within a marine park; or if any changes to intended operations (requested through consultation). | The DNP should 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. Notification should be provided to the 24-hour Marine Compliance Duty Officer on 0419 293 465. The notification should include:<br>• titleholder details<br>• time and location of the incident (including name of marine park likely to be affected)<br>• proposed response arrangements as per the OPEP (such as dispersant, containment)<br>• confirmation of providing access to relevant monitoring and evaluation reports when available | So far as reasonably practicable prior to response action being written. | Oral and written | Director of National Parks |

| Initiation | Required Information | Timing | Type | Recipient |
|---|---|---|---|---|
| | • contact details for the response coordinator.<br>Note that the DNP may request daily or weekly Situation Reports, depending on the scale and severity of the pollution incident. | | | |
| | Notify if details regarding the activity change and result in an overlap with or new impact to a marine park. | As soon as practicable. | Written | DNP: marineparks@awe.gov.au |
| <u>OPGGS(E) Regulation 24(c), 47 & 48 – Reportable Incident</u><br>NOPSEMA must be notified of any reportable incidents.<br>For the purposes of Regulation 24(c), a reportable incident is defined as:<br>'an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage'. | The oral notification must contain:<br>• all material facts and circumstances concerning the reportable incident known or by reasonable search or enquiry could be found out.<br>• any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident.<br>• the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident. | As soon as practicable, and in any case not later than two hours after the first occurrence of a reportable incident, or if the incident was not detected at the time of the first occurrence, at the time of becoming aware of the reportable incident. | Oral | NOPSEMA |
| | A written record of the oral notification must be submitted. The written record is not required to include anything that was not included in the oral notification. | As soon as practicable after the oral notification. | Written | NOPSEMA<br>National Offshore Petroleum Titles Administrator |
| | A written report must contain:<br>• all material facts and circumstances concerning the reportable incident known or by reasonable search or enquiry could be found out<br>• any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident<br>• the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident<br>• the action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future.<br>Consider reporting using NOPSEMA's Report of an Accident, Dangerous Occurrence or Environmental Incident form. | Must be submitted as soon as practicable, and in any case not later than three days after the first occurrence of the reportable incident unless NOPSEMA specifies otherwise.<br>Same report to be submitted to NOPTA within seven days after giving the written report to NOPSEMA. | Written | NOPSEMA<br>National Offshore Petroleum Titles Administrator |

| Initiation | Required Information | Timing | Type | Recipient |
|---|---|---|---|---|
| OPGGS(E) Regulation 50 – Recordable Incidents<br>NOPSEMA must be notified of a breach of an EPO or EPS, in the environment plan that applies to the activity that is not a reportable incident. | Complete NOPSEMA's Recordable Environmental Incident Monthly Report form. | As soon as practicable after the end of the calendar month, and in any case, not later than 15 days after the end of the calendar month. | Written | NOPSEMA |
| OPGGS(E) Regulation 51 – Environmental Performance<br>NOPSEMA must be notified of the environmental performance at the intervals provided for in the EP. | Report must contain sufficient information to determine whether or not environmental performance outcomes and standards in the EP have been met.<br>Performance outcomes and standards relating to passive bird deterrents will also be included. | A detailed environmental performance report for a twelve-month period commencing the date of EP acceptance, shall be submitted to NOPSEMA within 3 months post reporting timeframe, on annual basis. | Written | NOPSEMA |
| WA Museum<br>This is a standing arrangement with DCCEEW | Notify regulators of the discovery of any suspected UCH identified during the planning, development, operation, or decommissioning. | Within 21 days of the discovery. | Written | DCCEEW<br>Australasian Underwater Cultural Heritage Database at:<br>https://environment.gov.au/shipwreck/public/forms/notification |
| **End of Activity** | | | | |
| OPGGS(E) Regulation 54 – Notifications<br>NOPSEMA must be notified that the activity is completed. | NOPSEMA must be notified that the activity is complete. | Within ten days after cessation of each activity campaign. | Written | NOPSEMA |
| OPGGS(E) Regulation 22(7) & 51 – Environmental Performance<br>NOPSEMA must be notified of the environmental performance of the activity. | Report must contain sufficient information to determine whether or not environmental performance outcomes and standards in the EP have been met. | A detailed environmental performance report for a twelve-month period commencing from the date of EP acceptance, shall be submitted to NOPSEMA within 3 months post reporting timeframe, on annual basis. | Written | NOPSEMA |
| OPGGS(E) Section 46<br>EP ends when titleholder notifies completion, and the Regulator accepts the notification.<br>NOPSEMA must be notified that the activity has ended, and all EP obligations have been completed. | Notification advising NOPSEMA of end of all activities to which the EP relates and that all obligations have been completed. | Within 12 months of the final Section 54 (2) notification. | Written | NOPSEMA |

### 8.9.2 Monitoring and Recording Emission and Discharges

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 22(6) Implementation Strategy for the Environment Plan** |
| Includes an appropriate implementation strategy and monitoring, recording, and reporting arrangements. |
| **Section 34(e) Criteria for Acceptance of Environment Plan** |
| The implementation strategy must provide for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and standards in the environment plan are being met. |

Vessel-based discharges to the marine environment associated with this activity will be recorded and controlled in accordance with requirements under relevant marine orders.

Santos and contractors will maintain records so that emissions and discharges can be determined or estimated. Such records will be maintained for a period of five years. Contractors are required to make these records available upon request. Santos records discharges or emissions (where practicable), to the environment as described in Table 8-5

**Table 8-5: Monitoring methods for emissions and discharges**

| Discharge/Emission | Parameter | Record | Recording Frequency |
|---|---|---|---|
| Chemicals (discharged to the marine environment as per Sections 6.6 and 6.7) | Volume | Chemical risk assessment<br>Volumes used will be estimated based on known inventories | For every chemical use with a fate to the marine environment |
| Oily water | Volume and location | Oil record book * or equivalent | For every discharge |
| Garbage (including food scraps) | Volume and location | Garbage record book* | For every discharge |
| Sewage | Volume and location | Sewage record book* | For every discharge |
| Ballast water | Volume and location | Ballast water record book or log** | For every discharge |
| Unplanned discharge of solid objects | Volume | Incident report | For every discharge |
| Unplanned discharge of hazardous liquids | Volume | Incident report | For every discharge |
| Unplanned hydrocarbon release | Volume | Incident report | For every discharge |
| Atmospheric emissions | Fuel use and flaring volume | GHG calculations based on measured fuel use and flared hydrocarbons in accordance with NGER reporting requirements | Daily fuel use / flaring volume<br>Annual NGER reporting |

** Maintained as per vessel class in accordance with relevant Marine Orders*

*** Maintained as per Australian Ballast Water Management Requirements (Department of Agriculture, Water and the Environment, 2020)*

# 8.10 Document Management

### 8.10.1 Information Management and Document Control

This EP, as well as approved management of change documents, are controlled documents and current versions will be available on Santos' intranet. Santos' contractors are also required to maintain current versions of these documents.

Environmental performance outcomes (EPOs) and standards will be measured based on the measurement criteria listed in Table 8-2. Such records will be maintained for a period of five years. Contractors are required to make these records available upon request.

### 8.10.2 Management of Change

The Management of Change (MoC) process provides a systematic approach to initiate, assess, document, approve, communicate and implement changes to EPs and OPEPs.

The MoC process considers Sections18, 19, 26(3) to (5), 38 and 39 of the OPGGS(E)R 2023 and determines if a proposed change can proceed and the manner in which it can proceed. The MoC procedure will determine whether a revision of the EP is required and whether that revision is to be submitted to NOPSEMA.

An MOC will be conducted the event of a ‘potentially significant new impact or risk’ where the impact or risk is new because it arises from facts and circumstances which did not exist at the time of EP acceptance. The process will then determine if the activity can go ahead under the existing EP or if a revision to the EP is required.

For a change to proceed under the in-force EP, the associated environmental impacts and risks must be demonstrated to be acceptable and ALARP and must not be deemed significant. Additional stakeholder consultation may be required, depending on the nature and scale of the change. Additional information about the MoC process is provided in Figure 8-1.

If the MOC process identifies that there is a significant new environmental impact or risk, or significant increase in an existing environmental impact or risk, not provided for in the EP in force for the activity a revision to the EP is required. This also includes if a series of new environmental impacts or risks, or a series of increases in existing environmental impacts or risks, which, taken together, amount to the occurrence of:

- a significant new environmental impact or risk, or
- a significant increase in an existing environmental impact or risk that is not provided for in the EP in force for the activity

The MoC procedure allows for the assessment of new information that may become available after EP acceptance, such as new management plans for Australian Marine Parks, new recovery plans or conservation advice for threatened or migratory species, and changes to the Protected Matters Search results. If a review identifies new information, this is treated as a ‘Change that has an impact on EP’, and the MoC process is followed accordingly.

The MoC procedure also includes an assurance check process which applies the MoC process to long- term (usually five-year multi-activity EPs) EPs that may have lengthy periods of time between use or acceptance and activity commencement. Where there is an identified change from the accepted EP content, a check is done to test the ‘significance’ of the change, to determine whether it can be accommodated which may then result in an MoC as described above.

Accepted MoCs become part of the in-force EP or OPEP, are tracked on a register and are made available on Santos’ intranet. Where appropriate, the EP compliance register will be updated so that control measure or Environmental Performance Standard changes are communicated to the workforce and implemented. In the event that an MoC has been developed, it will be distributed to the appropriate management personnel identified in Table 8-3 (excluding the Chief Executive Officer and Directors), and the most relevant management position will ensure the MoC is communicated and implemented, which may include crew meetings, briefings or communications as appropriate for the change.

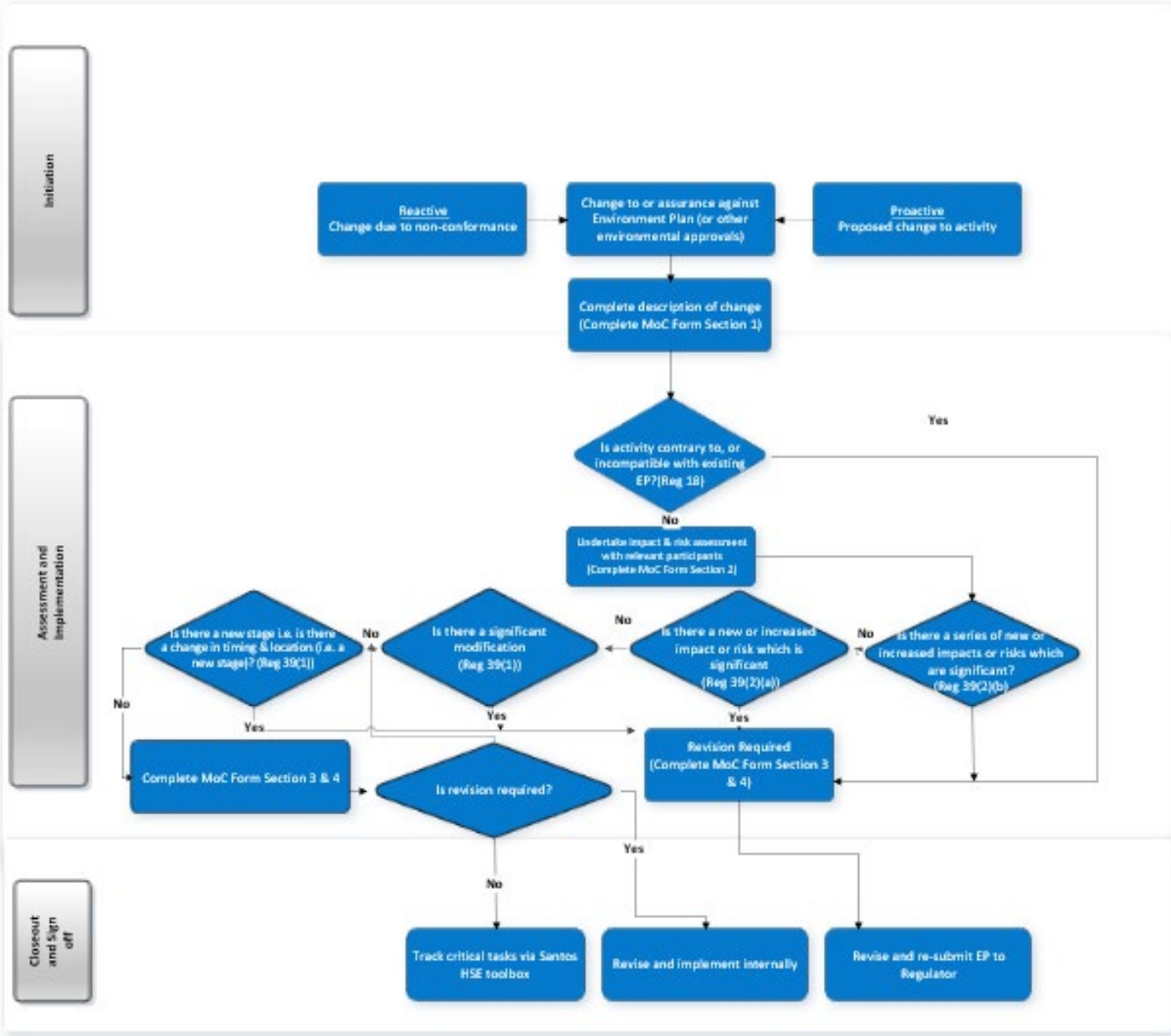



**Figure 8-1: EP MoC process schematic**

### 8.10.3 Reviews

This EP has assessed the environmental impacts and risk from the proposed activity during any time of the year. Information and requirements that have informed the assessment of environmental impacts and risks may change, such as:

- legislation
- businesses conditions, activities, systems, processes, and people
- industry practices
- science and technology
- societal and stakeholder expectations.

To ensure Santos maintains up-to-date knowledge of the industry, legislation and conservation advice, the following tasks are undertaken:

- maintain membership of the Australian Energy Producers (AEP), which provides a mechanism for communicating potential changes in legislation, industry practice and other issues that may affect EP implementation to relevant personnel in Santos
- undertake annual spill response exercises to check spill response arrangements and capability are adequate
- identify stakeholders prior to the activity commencing under this EP via the mechanisms outlined in Section 4
- review the values and sensitivities within the EMBA which includes completing a new Protected Matters Search, reviewing Appendix C against relevant legislation to capture and review any relevant updates and incorporate as required, and reviewing any recently known published relevant scientific papers
- monitoring the AIMS North West Shoals to Shore Research Program, specifically the fish and pearl oyster impact studies
- reviewing the DPIRD *WA Prevention List for Introduced Marine Pests* prior to each survey stage
- subscription to NOPSEMA's 'The Regulator' issued quarterly
- subscribe to various regulator updates
- have regular liaison meetings with Regulators.

Through maintenance of up-to-date knowledge, changes to information and requirements that inform the assessment of environmental impacts and risks are identified. If the changes are material to the assessment of environmental impacts and risks from the activity, the EP will be reviewed, and any changes required documented in accordance with Santos' MoC procedure (Section 8.10.2).

## 8.11 Audits and Reviews

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 22(5) Implementation Strategy for the Environment Plan** |
| The implementation strategy must provide for sufficient monitoring, recording, audit, management of nonconformance and review of the titleholder's environmental performance and the implementation strategy to ensure that the environmental performance outcomes and standards in the environment plan are being met. |

### 8.11.1 Audits

Santos audit plans and schedules are reviewed and updated at the beginning of each calendar year and cover all Santos facilities and activities. Santos' audit schedule may be amended to accommodate operational priorities, activity risk, personnel availability or high audit demand during certain periods (for example, regulatory audits, contractor audits). Santos will determine if a vessel audit is required following contract award and vessel confirmation.

Audits will be undertaken in a manner consistent with *Santos' Assurance Technical Standard*. Audit scope typically includes a selection of control measures, EPSs and EPOs. However, audits may also include other parts of the EP. Audits findings may include opportunities for improvement and non-conformances. Audit non-conformances are managed as described in Section 8.11.3.

### 8.11.2 Inspections

During an activity, HSE inspections (desktop or vessel based) will be conducted at least once during each campaign activity to identify hazards, incidents and EP non-conformances. These inspections will also check compliance against the EPOs and EPS of this EP (Table 8-2) and inform end of activity reporting (Table 8-4). Any in-field opportunities for improvement or corrective actions will be discussed during the inspection with the Vessel Master or MODU Offshore Installation Manager.

### 8.11.3 Non-conformance Management

EP non-conformances will be addressed and resolved by a systematic corrective action process, as outlined in Santos' Assurance Technical Standard. Non-conformances arising from audits and inspections will be entered into Santos' incident and action tracking management system (as in, HSE Toolbox). Once entered, corrective actions, timeframes and responsible persons (including action owners and event validators) will be assigned. Corrective action 'close out' will be monitored using a management escalation process. Any non-conformances that trigger recordable or reportable incident reporting to NOPSEMA will be managed per Section 8.8 and Section 8.9.

### 8.11.4 Continuous Improvement

For this EP, continuous improvement will be driven by the list below and may result in a review of the EP with changes applied in accordance with Section 8.10.2:

- improvements identified from the review of business-level HSE key performance indicators
- actions arising from Santos and departmental HSE improvement plans
- corrective actions and feedback from HSE audits and inspections, incident investigations and after-action reviews
- opportunities for improvement and changes identified during pre-activity reviews and MoC documents
- actions taken to address concerns and issues raised during the ongoing stakeholder management process (Section 4).

Identified continuous improvement opportunities will be assessed in accordance with the MoC process to ensure any potential changes to this EP, or OPEP, are managed in accordance with the Regulations and in a controlled manner.

## 8.12 Post Acceptance Consultation Implementation Strategy

| OPGGS(E)R 2023 Requirements |
|---|
| **Section 22(15) Implementation Strategy for the Environment Plan** |
| The implementation strategy must provide for appropriate consultation with:<br>a) relevant authorities of the Commonwealth, a State or a Territory; and<br>b) other relevant interested persons or organisations. |

Santos is committed to appropriate post acceptance consultation implementation for this activity with relevant government authorities and other relevant interested persons and organisations.

Post acceptance consultation activities for this EP will be principally supported by Santos' regional engagement program for its existing operational footprint in the Bedout Basin, with a focus on First Nations people and groups and local governments, communities and industry with interests in the lands and waters of the adjacent Pilbara region.

Information will be provided principally by way of quarterly written activity updates. Santos includes in its supporting communications to recipients of the quarterly update (including those listed in this Section) if they:

- Would like to receive pre-start and upon completion activity notifications for planned activities.
- Would like to provide feedback about these activities as part of our ongoing consultation activities.
- Know of any other authorities, organisations or individuals who Santos should contact to seek feedback.

Santos will also use email notifications where relevant to keep relevant authorities or other relevant interested persons or organisations informed of intermittent activities, such as maintenance or project activities.

Consideration of whether notifications are required for an intermittent activity will be given prior to the commencement of that activity. If notification is required, it will be undertaken in a format that is relevant given the information needs of the authority, person or organisation.

Timeframes for consultation notifications, if required, are outlined in Table 8-6.

Santos will continue to accept, assess and respond to post acceptance consultation feedback during the life of the EP. Records of any post acceptance consultation will be maintained in an appropriate Santos consultation database.

If, during the course of post acceptance consultation, Santos receives information demonstrating a new or increased environmental impact or risk that is not provided for in this EP, as in force at the time, Santos will apply its Management of Change process outlined in Section 8.10.2

Santos will maintain a database of relevant authorities, and other relevant interested persons and organisations for this Activity. This includes updating its database in light of post acceptance consultation, including identification of new Relevant Persons.

### 8.12.1 Government authorities

For this EP, Santos will provide quarterly written activity updates to the following government authorities:

- Commonwealth Government – Australian Maritime Safety Authority
- Western Australian Government – Pilbara Ports.

Although agreement has not yet been reached on the final approach to explore in shipping fairways, Santos will continue to engage with AMSA, to ensure the requirements for fairway modification are met; and will also continue to engage with AMSA via regular meetings to ensure ongoing safety of navigation is upheld – throughout the life of this EP (BB-CM-64).

In addition to the above, Santos will also actively engage with Australian Hydrographic Office on the proposal to modify shipping fairways for safe navigation in the Bedout basin and to ensure nautical/navigational charts are updated following any shipping fairway modifications (BB-CM-66).

### 8.12.2 Local Government, Communities and Industry

For this EP, Santos will provide quarterly written activity updates to the following representative organisations:

- Local government – Town of Port Hedland
- Local industry – Port Hedland Chamber of Commerce and Industry
- Recreational fishing organisations – Port Hedland Game Fishing Club
- Community organisations – Care for Hedland.

Santos will also provide quarterly written activity updates to the commercial fishing industry via its representative organisation, Western Australian Fishing Industry Council and to the recreational fishing community via its representative organisation, Recfishwest.

Other than the quarterly written updates above, Santos has elected not to provide activity updates to other local government and associated communities, unless otherwise requested.

### 8.12.3 First Nations People and Groups

For this EP, Santos will provide quarterly written activity updates via Representative Aboriginal/Torres Strait Islander Bodies and Prescribed Bodies Corporate, specifically to the nominated contacts for:

- Kimberley Land Council
- Yamatji Marlpa Aboriginal Corporation
- Kariyarra Aboriginal Corporation
- Nyangumarta Warrarn Aboriginal Corporation
- Wanparta Aboriginal Corporation

**Table 8-6: Consultation and standing arrangement notifications**

| Initiation | Required Information | Timing | Type | Recipient |
|---|---|---|---|---|
| **Before the Activity** | | | | |
| Department of Defence (DoD)<br>Standing arrangement with DoD | Activity timing, location, description, and vessel contact details.<br>Confirm restricted air space status. | At least five weeks before the activity commences where practicable. | Written | DoD: offshore.petroleum@defence.gov.au |
| Australian Fisheries Management Authority (AFMA)<br>Standing arrangement with AFMA | Activity timing, location, description, and vessel contact details. | At least four weeks before the activity commences where practicable. | Written | AFMA: petroleum@afma.gov.au; OffshoreEnergy@afma.gov.au |
| Australian Hydrographic Office (AHO)<br>Standing arrangement with AHO | Activity timing, location, description, and vessel contact details. | At least four weeks before the activity commences where practicable. | Written | AHO: datacentre@hydro.gov.au |
| Department of Mines, Petroleum and Exploration (DMPE)<br>Standing arrangement with DMPE | Activity timing, location, description, and vessel contact details. | At least ten days before the activity commences where practicable. | Written | DMPE: online@dmpe.wa.gov.au |
| Department of Agriculture, Fisheries and Forestry (DAFF)<br>Standing arrangement with DAFF | Activity timing, location, description, and vessel contact details. | At least four weeks before the activity commences where practicable. | Written | DAFF: Petroleum&Fisheries@agriculture.gov.au |
| Director of National Parks – Marine Parks Authorisations (DNP)<br>Standing arrangement with DNP | Activity timing, location, description, and vessel contact details. | At least four weeks before the activity commences where practicable. | Written | DNP – Marine Parks Authorisations: marineparksauthorisations@dcceew.gov.au |
| Department of Primary Industries and Regional Development (DPIRD)<br>Standing arrangement with DNP | Activity timing, location, description, and vessel contact details. | At least four weeks before the activity commences where practicable. | Written | DPIRD: Environment@dpird.wa.gov.au; enquiries@dpird.wa.gov.au |
| Licence Holder in the Mackerel Managed Fishery | Activity timing, location, and description. | At least four weeks before the activity commences where practicable. | Written and | Details held with Santos |

| Initiation | Required Information | Timing | Type | Recipient |
|---|---|---|---|---|
| | | | phone call | |
| Recfishwest<br>Standing arrangement with Recfishwest | Activity timing, location, description, and vessel contact details. | At least four weeks before the activity commences where practicable. | Written | Recfishwest: info@recfishwest.org.au |
| Western Australian Fisheries Industry Council (WAFIC)<br>Standing arrangement with WAFIC | Activity timing, location, description, and vessel contact details. | At least four weeks before the activity commences where practicable. | Written | WAFIC: oilandgas@wafic.org.au |
| Tuna Australia (TA)<br>Standing arrangement with TA | Activity timing, location, description, and vessel contact details. | At least four weeks before the activity commences where practicable. | Written | Contact details as provided by Tuna Australia |
| | Activity timing, location, description, and vessel contact details. | 48–24 hour prior to the start of activities for marine seismic surveys. | Written | Contact details as provided by Tuna Australia |
| Australian Maritime Safety Authority (AMSA) Joint Rescue Coordination Centre (JRCC)<br>Standing arrangement with AMSA JRCC. | Notification to AMSA's JRCC of proposed start and end dates and any other relevant information for the Notice to Mariners to be issued.<br>AMSA's JRCC requires the:<br>• vessel details (including name, callsign and Maritime Mobile Service Identity)<br>• satellite communications details (including INMARSAT-C and satellite telephone numbers)<br>• area of operation<br>• requested clearance from other vessels<br>• any other information that may contribute to safety at sea<br>• when operations start and end.<br>This reporting will be performed prior to the start of the CoP campaigns. | 24–48 hours before the activity commences. | Written | AMSA's JRCC: rccaus@amsa.gov.au |
| AHO Notification<br>Standing arrangement with AHO. | Any changes to the intended operations. | As soon as practicable. | Written | AHO: datacentre@hydro.gov.au |

| Initiation | Required Information | Timing | Type | Recipient |
|---|---|---|---|---|
| **During the Activity** | | | | |
| DPIRD notification | Notification of a spill event. | Within 24 hours of Santos reporting the incident to the appropriate authority. | Written | DPIRD: environment@dpird.wa.gov.au |
| Care for Hedland notification | Notification of a spill event. | As soon as practicable. | Oral or written | coordinator@careforhedland.org.au |
| Kariyarra Aboriginal Corporation notification<br>Requested during consultation | Notification of a spill event. | As soon as practicable. | | CEO: james.gibson@kariyarra.com.au |
| Murujuga Aboriginal Corporation notification | Notification of a spill event. | As soon as practicable. | Oral or written | CEO: ceo@murujuga.org.au |
| Ngarluma Aboriginal Corporation notification<br>Requested during consultation | Notification of a spill event. | As soon as practicable. | Oral or written | ceo@ngarluma.com.au |
| Nhuwala Claim Group notification | Notification of a spill event. | As soon as practicable. | Oral or written | Contact details as provided by Nhuwala Claim Group |
| Wirrawandi Aboriginal Corporation notification | Notification of a spill event. | As soon as practicable. | Oral or written | Contact details as provided by Wirrawandi Aboriginal Corporation: |
| WAFIC | Phone call within 24 hours of incident being identified with potential to impact to the WA commercial fisheries | Within 24 hours | Oral or written | WAFIC: oilandgas@wafic.org.au |
| | To be included on the vessel operations look ahead. | | Written | WAFIC: oilandgas@wafic.org.au |
| DCCEEW<br>Standing arrangement with DCCEEW | Notify regulators of the discovery of any suspected UCH identified during the planning, development, operation, or decommissioning. | Within 21 days of the discovery. | Written | DCCEEW<br>Australasian Underwater Cultural Heritage Database at:<br>https://environment.gov.au/shipwreck/public/forms/notification.<br>reception@museum.wa.gov.au |
| Recfishwest<br>Standing arrangement with Recfishwest | As activity progresses, included in updates | During campaign | Written | Recfishwest: info@recfishwest.org.au |
| Santos' commitment to include activity in Quarterly Consultation Update until activity ends. | The Quarterly Consultation Update will include the activity. This consultation will cease once the activity has ended. | Quarterly. | Written | The Quarterly Consultation Update is circulated to a broad group of Santos' stakeholders, including many of the stakeholders identified in Section 4. |

| Initiation | Required Information | Timing | Type | Recipient |
|---|---|---|---|---|
| **End of Activity** | | | | |
| AHO<br>AFMA<br>AMSA JRCC<br>DAFF<br>DoD<br>DPIRD<br>DMPE<br>DNP – Marine Parks Authorisations<br>Recfishwest<br>WAFIC<br>Tuna Australia | Activity cessation notification. | Within ten days after cessation of each campaign. | Written | AHO: datacentre@hydro.gov.au<br>AFMA: petroleum@afma.gov.au<br>AMSA's JRCC: rccaus@amsa.gov.au<br>DAFF: Petroleum&Fisheries@agriculture.gov.au<br>DoD: offshore.petroleum@defence.gov.au<br>DPIRD: Environment@dpird.wa.gov.au<br>DMPE: online@dmpe.wa.gov.au<br>DNP – Marine Parks Authorisations: marineparksauthorisations@dcceew.gov.au<br>Recfishwest: info@recfishwest.org.au<br>WAFIC: oilandgas@wafic.org.au<br>Tuna Australia: details on file |

# 9. References


Abdul Wahab, M.A., Fromont, J., Gomez, O., Fisher, R., Jones, R., 2017. Comparisons of benthic filter feeder communities before and after a large-scale capital dredging program. Marine Pollution Bulletin 122, 176–193. https://doi.org/10.1016/j.marpolbul.2017.06.041

Australian Bureau of Agricultural and Resource Economics and Sciences. 2024. ABARES Fisheries Status Report. Available from: https://www.agriculture.gov.au/abares/research-topics/fisheries/fishery-status

ANZG. 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Canberra ACT, Australia, Australian and New Zealand Governments and Australian state and territory governments.

Arthur, K.E., Boyle, M.C., Limpus, C.J. (2008). Ontogenetic changes in diet and habitat use in green sea turtle (Chelonia mydas) life history. Marine Ecology Progress Series 362: 303–311.

Australian Maritime Safety Authority (AMSA), 2015. Technical guidelines for preparing contingency plans for marine and coastal facilities. Australian Maritime Safety Authority, Canberra.

Australian Maritime Safety Authority (AMSA), 2020. National Plan for Maritime Emergencies – 2020 edition, from

https://www.amsa.gov.au/sites/default/files/national-plan-maritime-envrironmental-emergencies-2020.pdf

Australian Maritime Safety Authority (AMSA), 2025, Vessel Tracking Data.Spatial@AMSA. Retrieved July 06, 2025, from https://www.operations.amsa.gov.au/spatial/DataServices/DigitalData

Austin, M.E. and G.A. Warner. 2012. Sound Source Acoustic Measurements for Apache's 2012 Cook Inlet Seismic Survey. Version 2.0. Technical report by JASCO Applied Sciences for Fairweather LLC and Apache Corporation.

Austin, M.E., Hannay, D.E., Bröker, K.C., 2018a. Acoustic characterization of exploration drilling in the Chukchi and Beaufort seas. The Journal of the Acoustical Society of America 144, 115–123.

Bakke, T., Klungsøyr, J., Sanni, S., 2013. Environmental impacts of produced water and drilling waste discharges from the Norwegian offshore petroleum industry. Marine Environmental Research 92, 154–169. https://doi.org/10.1016/j.marenvres.2013.09.012

Bahmanpour, M.H., Pattiaratchi, C., Wijeratne, E.M.S., Steinberg, C., D'Adamo, N. 2016. Multi-Year Observation of Holloway Current along the Shelf Edge of North Western Australia. Journal of Coastal Research 75, 517-521.

Barnes, L., Hall, K., Blount, C., Hooper, M., van Senden, D., Costen, A., Scraggs, C., Provis, D., Pygas, D., 2019. Monitoring marine effects of produced formation water discharge in Bass Strait. The APPEA Journal 59, 1–24.

Bax, N., Williamson, A., Aguero, M., Gonzalez, E., Geeves, W., 2003. Marine invasive alien species: a threat to global biodiversity. Marine Policy 27, 313–323.

Bejarano, A.C., J.R. Clark, and G.M. Coelho. 2014. Issues and challenges with oil toxicity data and implications for their use in decision making: a quantitative review. Environmental Toxicology and Chemistry 33: 732–742. Doi: 10.1002/etc.2501. Epub 2014 Feb 25

Bejarano, A.C., W. W. Gardiner, M. G. Barron, and J. Q. Word. (2017). Relative sensitivity of Arctic species to physically and chemically dispersed oil determined from three hydrocarbon measures of aquatic toxicity. Marine Pollution Bulletin 122 (2017) 316–322. https://pubmed.ncbi.nlm.nih.gov/28684107/

BHP (2011). Appendix A1: Marine Turtle Management Plan.

Bock, M., Robinson, H., Wenning, R., French-McCay, D., Rowe, J., and Hayward Walker, A., 2018. Comparative risk assessment of oil spill response options for a deepwater oil well blowout: Part II. Relative risk methodology. Marine Pollution Bulletin, Volume 133. Pp 984-1000. Elsevier.

Birdlife International (2018). Species Profiles.

Burbidge, A.A., Fuller, P.J., Lane, J., Moore, S.A. (1987). Counts of nesting boobies and lesser frigate-birds in Western Australia. Emu 87: 128–129.

Bureau of Meteorology (2023). Australian tropical cyclone season long-range forecast for 2023 to 2024. Available at: http://www.bom.gov.au/climate/cyclones/australia/archive/20231009.archive.shtml [accessed 12 September 2024].

Butler, I., Patterson, H., Bromhead, D., Galeano, D., Timmiss, T., Woodhams, J., Curtotti, R. (2024). Fishery Status Reports 2023. Australian Bureau of Agricultural and Resource Economics and Sciences (Edition 29), Department of Agriculture, Commonwealth of Australia.

Cannell, B., Hamilton, S., Driessen, J., 2019. Wedge-tailed shearwater behaviour in the Exmouth region. University of Western Australia, Perth.

Cato, D.H., Noad MJ, Dunlop RA, McCauley RD. (2019). "Project BRAHSS: behavioural response of Australian humpback whales to seismic surveys. Final report." Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2019-0002. 90 pp.

http://www.soundandmarinelife.org/library/project-reports.aspx.

Clark, J.R., Bragin, G.E., Febbo, R.J. and Letinski, D.J. (2001). Toxicity of physically and chemically dispersed oils under continuous and environmentally realistic exposure conditions: Applicability to dispersant use decisions in spill response planning. Pp. 1249–1255 in Proceedings of the 2001 International Oil Spill Conference, Tampa, Florida. American Petroleum Institute, Washington, D.C.

[CoA] Commonwealth of Australia. 2022. National Recovery Plan for the Australian Painted Snipe (Rostratula australis). Commonwealth of Australia, Canberra. Available from: https://www.dcceew.gov.au/sites/default/files/documents/national-recovery-plan-australian-painted-snipe-2022.pdf

Commonwealth of Australia (CoA) (2006). A Guide to the Integrated Marine and Coastal Regionalisation of Australia Version 4.0. Department of the Environment and Heritage, Canberra, Australia.

Commonwealth of Australia. (2012). Conservation management plan for the southern right whale: A recovery plan under the Environment Protection and Biodiversity Conservation Act 1999 2011–2021. Canberra: Department of Sustainability, Environment, Water, Population and Communities.
https://www.dcceew.gov.au/sites/default/files/documents/southern-right-whale-cmp-2011.pdf

Commonwealth of Australia (CoA), 2015a. Sawfish and river shark multispecies recovery plan (Recovery Plan). Department of the Environment, Canberra.

Commonwealth of Australia (CoA), 2015b. Conservation Management Plan for the blue whale: A recovery plan under the Environment Protection and Biodiversity Conservation Act 1999 2015-2025. Department of the Environment, Canberra.

Commonwealth of Australia (CoA), 2015c. Wildlife conservation plan for migratory shorebirds. Department of the Environment, Canberra.

Commonwealth of Australia (CoA), 2015d. Conservation Advice *Anous tenuirostris melanops* (Australian lesser noddy). Department of the Environment, Canberra.

Commonwealth of Australia (CoA), 2017. Recovery Plan for Marine Turtles in Australia 2017-2027. Department of the Environment and Energy, Canberra.

Commonwealth of Australia (CoA), 2018a. Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans. Department of the Environment and Energy, Canberra.

Commonwealth of Australia (CoA), 2018b. Threat abatement plan for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations (2018). Department of the Environment and Energy, Canberra.

Commonwealth of Australia (CoA), 2020. Wildlife Conservation Plan for Seabirds. Department of the Environment and Energy, Canberra.

Commonwealth of Australia (CoA), 2022. National Recovery Plan for albatrosses and petrels (2022). Department of Climate Change, Energy, the Environment and Water, Canberra.

Commonwealth of Australia (COA) 2022. Climate Active Carbon Neutral Standard for Organisations.

Costello, M.J. and Read, P. (1994). Toxicity of sewage sludge to marine organisms: A review, Marine Environmental Research, 37(1), 23–46. https://doi.org/10.1016/0141-1136(94)90061-2.

Cresswell, G. (1991). The Leeuwin Current – observations and recent models. Journal of the Royal Society of Western Australia 74: 1–14.

CSIRO (2025). State of the Climate 2024. The Bureau of Meteorology and CSIRO, Commonwealth of Australia. Accessed at:

https://www.csiro.au/en/research/environmental-impacts/climate-change/state-of-the-climate

Dale, J.J., Gray, M.D., Popper, A.N., Rogers, P.H., Block, B.A., 2015. Hearing thresholds of swimming Pacific bluefin tuna Thunnus orientalis. Journal of Comparative Physiology A 201, 441–454. https://doi.org/10.1007/s00359-015-0991-x

Day, R.D., McCauley, R.D., Fitzgibbon, Q.P., Hartmann, K., Semmens, J.M., 2016. Assessing the impact of marine seismic surveys on southeast Australian scallop and lobster fisheries. University of Tasmania, Hobart.

Department of Agriculture, Fisheries and Forestry (DAFF), 2011. Australian Ballast Water Management Requirements – Version 8. Accessed at:https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/biosecurity/avm/vessels/ballast/australian-ballast-water-management-requirements.pdf

Department of Agriculture, Water, and the Environment (DAWE), 2021. Guidance on key terms within the Blue Whale Conservation Management Plan. DAWE, Canberra.

Department of Agriculture, Fisheries and Forestry 2023. Australian biofouling management requirements, Version 2.

DEC (2006). MTR1: Background quality of the marine sediments of the Pilbara coast. Marine Technical Report Series. Western Australia Department of Environment and Conservation, October 2006, 72 pp.

DEC (2007). Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves 2007-2017. Management Plan Number 55. Department of Conservation and Land Management, Western Australia.

DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2022). Quarterly Update of Australia's National Greenhouse Gas Inventory: December 2022, DCCEEW. Available from: https://www.dcceew.gov.au/sites/default/files/documents/nggi-quarterly-update-dec-2022.pdf, accessed July 2023.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2023a. National Light Pollution Guidelines for Wildlife. DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2023b. Conservation Advice for Charadrius leschenaultii (greater sand plover). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024a. National Recovery Plan for the Southern Right Whale (Eubalaena australis). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024b. Conservation Advice for Aipysurus fuscus (dusky sea snake). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024c. Conservation Advice for Limnodromus semipalmatus (Asian dowitcher). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024d. Conservation Advice for Limosa limosa (black-tailed godwit). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024e. Conservation Advice for Tringa nebularia (common greenshank). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024f. Conservation Advice for Calidris tenuirostris (great knot). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024g. Conservation Advice for Pluvialis squatarola (grey plover). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024h. Conservation Advice for Xenus cinereus (terek sandpiper). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024i. Conservation Advice for Arenaria interpres (ruddy turnstone). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024j. Australasian Underwater Cultural Heritage Database. DCCEEW, Canberra.

[DCCEEW] Department of Climate Change, Energy, the Environment and Water (2023a). Conservation Advice for Calidris ferruginea (curlew sandpiper). Canberra: Department of Climate Change, Energy, the Environment and Water. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/856-conservation-advice-18122023.pdf

[DCCEEW] Department of Climate Change, Energy, the Environment and Water (2024a). Conservation Advice for Calidris acuminata (sharp-tailed sandpiper) Canberra: Department of Climate Change, Energy, the Environment and Water. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/874-conservation-advice-05012024.pdf

[DCCEEW] Department of Climate Change, Energy, the Environment and Water (2024b). Conservation Advice for Calidris canutus (red knot). Canberra: Department of Climate Change, Energy, the Environment and Water. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/855-conservation-advice-05012024.pdf

[DCCEEW] Department of Climate Change, Energy, the Environment and Water (2023c). Conservation Advice for Numenius madagascariensis (far eastern curlew). Canberra: Department of Climate Change, Energy, the Environment and Water. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/847-conservation-advice-18122023.pdf

[DCCEEW] Department of Climate Change, Energy, the Environment and Water (2024c). Conservation Advice for Limosa lapponica menzbieri (Yakution bar-tailed Godwit). Canberra: Department of Climate Change, Energy, the Environment and Water. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/86432-conservation-advice-05012024.pdf

[DCCEEW] Department of Climate Change, Energy, the Environment and Water (2025). Conservation Advice for Pristis pristis (largetooth sawfish). Canberra: Department of Climate Change, Energy, the Environment and Water. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/60756-conservation-advice-20082025.pdf

Department of Environment and Conservation (DoEC) (2007). Management plan for the Montebello/Barrow Islands Marine Conservation Reserves. Marine Parks and Reserves Authority, Perth.

Department of Planning, Lands and Heritage (DPLH) (2024). Aboriginal Heritage Inquiry System. Department of Planning, Lands and Heritage, Canberra.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012a. Marine bioregional plan for the North-west Marine Region: prepared under the Environment Protection and Biodiversity Conservation Act 1999. Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available at: https://www.dcceew.gov.au/environment/marine/marine-bioregional-plans/north-west#dcceew-main [accessed 15 September 2024].

Department of Environment and Energy, 2017. National Strategy for Reducing Vessel Strike on Cetaceans and Other Marine Megafauna. https://www.dcceew.gov.au/sites/default/files/documents/vessel-strike-strategy.pdf

Department of the Environment and Energy (DoEE). 2017a. Australian National Guidelines for Whale and Dolphin Watching 2017. Available from https://www.dcceew.gov.au/environment/marine/marine-species/cetaceans/australian-national-guidelines-whale-and-dolphin-watching-2017

Department of the Environment (DoE), 2020. Conservation Advice *Neophoca cinerea* (Australian Sea Lion). DoE, Canberra.

Department of the Environment, Water, Heritage and the Arts. DEWHA. 2009. Approved Conservation Advice for *Pristis clavata* (Dwarf Sawfish). Canberra, ACT: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/68447-conservation-advice.pdf. In effect under the EPBC Act from 20-Oct-2009.

Director of National Parks (DNP) 2018. Australian Marine Parks – North-west Marine Parks Network Management Plan 2018. Director of National Parks, Canberra.

Double, M., Gales, N., Jenner, K., Jenner, M., 2010. Satellite tracking of south-bound female humpback whales in the Kimberley region of Western Australia. Australian Marine Mammal Centre, Hobart.

Double, M., Jenner, K., Jenner, M., Ball, I., Childerhouse, S., Loverick, S., Gales, N., 2012. Satellite tracking of northbound humpback whales (*Megaptera novaeangliae*) off Western Australia. Australian Marine Mammal Centre, Hobart

Double, M.C., Andrews-Goff, V., Jenner, K.C.S., Jenner, M.-N., Laverick, S.M., Branch, T.A., Gales, N.J., 2014. Migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia as revealed by satellite telemetry. PloS one 9, e93578.

Dunlop, R.A., Noad, M.J., McCauley, R.D., Kniest, E., Paton, D., Cato, D.H., 2015. The behavioural response of humpback whales (*Megaptera novaeangliae*) to a 20 cubic inch air gun. Aquatic Mammals 41, 412–433. https://doi.org/10.1578/AM.41.4.2015.412

Ellengowan Enterprises. 2025. Offshore Bedout, WA. Cultural Heritage Desktop Review. Report prepared for Santos Ltd.

Ellis J.I., Fraser, G., and Russell, J. 2012. Discharged drilling waste from oil and gas platforms and its effects on benthic communities. Marine Ecology Progress Series 456:285- 302.

Erbe, C., 2012. Effects of underwater noise in marine mammals, in: Popper, A., Hawkins, A. (Eds.), The Effects of Noise on Aquatic Life, Advances in Experimental Medicine and Biology. Springer, pp. 17–22.

Erbe, C., Reichmuth, C., Cunningham, K., Lucke, K., Dooling, R., 2016. Communication masking in marine mammals: a review and research strategy. Marine Pollution Bulletin 103, 15–38.

Environmental Protection Authority (2001). Guidance Statement for the protection of tropical arid zone mangroves along the Pilbara coastline (Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) No. 1). Environmental Protection Authority, Perth.

Fisher, R., Stark, C., Ridd, P., Jones, R., 2015. Spatial patterns in water quality changes during dredging in tropical environments. PLOS ONE 10, e0143309. https://doi.org/10.1371/journal.pone.0143309

French, D.P., Schuttenberg, H.Z., Isaji, T., 1999. Probabilities of oil exceeding thresholds of concern: examples from an evaluation for Florida Power and Light. Presented at the Arctic and Marine Oilspill Program Technical Seminar, Ministry of Supply and Services, Ottawa, pp. 243–270.

French-McCay, D, Whittier, N, Dalton, C, Rowe, J, Sankaranarayanan, S & Aurand, D (2005a), Modelling the fates of hypothetical oil spills in Delaware, Florida, Texas, California, and Alaska waters, varying response options including use of dispersants. Proceedings of the International Oil Spill Conference 2005, American Petroleum Institute, Washington DC, paper 399.

French-McCay, D., Whittier, N., Rowe, J., Sankaranarayanan, S., Kim, H-S. and Aurand, D. (2005b). Use of probabilistic trajectory and impact modelling to assess consequences of oil spills with various response strategies. Proceedings of the 28th Arctic and Marine Oil Spill Program (AMOP) Technical Seminar, Environment Canada, Ottawa, pp. 253–271.

French-McCay, D.P. 2002. Development and Application of an Oil Spill Toxicity and Exposure Model, OilToxEx. Environmental Toxicology and Chemistry 21(10): 2080–2094.

French-McCay, D. (2009). State-of-the-art and research needs for oil spill impact assessment modeling, in: Proceedings of the 32nd AMOP Technical Seminar on Environmental Contamination and Response. Presented at the 32nd AMOP Technical Seminar on Environmental Contamination and Response, Environment Canada, Ottawa, pp. 601–653.

French-McCay, D.P., T. F. Parkerton, and B. de Jourdan. 2023. Bridging the lab to field divide: advancing oil spill biological effects models requires revisiting aquatic toxicity testing.

French-McCay, D. P., Horn, M., Li, Z., Jayko, K., Spaulding, M. L., Crowley, D. and Mendelsohn, D, 2018. Modelling distribution, fate and concentrations of Deepwater Horizon oil in subsurface waters of the Gulf of Mexico. In Oil Spill Environmental Forensics Case Studies, Elsevier 2018.

French-McCay, April 27, 2025. Considerations for Development of Entrained Oil Thresholds for Oil Spill Risk. https://energyproducers.au/wp-content/uploads/2025/06/Oil-in-Water-Threshold-Review_French-McCay_2025Apr27-002.pdf

Friligos, N. (1985). Turnover time of waters in a deep basin in the Aegean sea. Estuarine, Coastal and Shelf Science, 21: 879-894.

Gates, A.R., Jones, D.O.B., 2012. Recovery of benthic megafauna from anthropogenic disturbance at a hydrocarbon drilling well (380 m depth in the Norwegian Sea). PLoS ONE 7, e44114. https://doi.org/10.1371/journal.pone.0044114

Gattuso, J.P., Gentili, B., Duarte, C.M., Kleypas, J.A., Middelburg, J.J., Antoine, D. 2006. Light availability in the coastal ocean: impact on the distribution of benthic photosynthetic organisms and their contribution to primary production. Biogeosciences, 3, 489–513, https://doi.org/10.5194/bg-3-489-2006, 2006.

Geiling, N., 2014. Arctic Shipping: Good for Invasive Species, Bad for the Rest of Nature. Smithsonian. Available at: http://www.smithsonianmag.com/science-nature/global-warmings-unexpectedconsequence-invasive-species-180951573/?no-ist.

Gray, J.S., 2002. Biomagnification in marine systems: the perspective of an ecologist. Marine pollution bulletin 45, 46–52

Gosby, C., Erbe, C., Harvey, E.S., Figueroa Landero, M.M., McCauley, R.D., 2022. Vocalizing humpback whales (*Megaptera novaeangliae)* migrating from Antarctic feeding grounds arrive earlier and earlier in the Perth Canyon, Western Australia. Frontiers in Marine Science 9.

Gaston, K.J., Duffy, J.P., Gaston, S., Bennie, J., Davies, T.W., 2014. Human alteration of natural light cycles: causes and ecological consequences. Oecologia 176, 917–931.

Gomez Isaza, D. F., Jones, R., Wilson, P., Pendoley, K., Fossette, S., Thums, M. 2025. The effect of artificial light at night on sea turtle hatchling early dispersal: A systematic review of methods, impacts and findings. Biological Conservation, 309.

Greene Jr, C.R., 1987. Characteristics of oil industry dredge and drilling sounds in the Beaufort Sea. The Journal of the Acoustical Society of America 82, 1315–1324.

Gulec, I. and Holdway, D.A. 2000. Toxicity of crude oil and dispersed crude oil to ghost shrimp Palaemon serenus and larvae of Australian bass Macquaria novemaculeata. Environmental Toxicology, 15(2): 91–98.

Hazel, J., Lawler, I.R. and Hamann, M. (2009). Diving at the shallow end: Green turtle behaviour in near-shore foraging habitat. Journal of Experimental Marine Biology and Ecology 371, 84–92.

https://doi.org/10.1016/j.jembe.2009.01.007.

International Association of Oil and Gas Producers, 2016. Environmental fates and effects of ocean discharge of drill cuttings and associated drilling fluids from offshore oil and gas operations (Report No. 543). International Association of Oil and Gas Producers, London.

Intergovernmental Panel on Climate Change (IPCC) (2018), Global Warming of 1.5 °C.An IPCC Special Report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, 616 pp. https://doi.org/ 10.1017/9781009157940.

International Tanker Owners Pollution Federation, 2011. Effects of oil pollution on the marine environment (Technical Information Paper No. 13). International Tanker Owners Pollution Federation Limited, London.

International Tankers Owners Pollution Federation (ITOPF) 2023, ITOPF Handbook 2023/24, ITOPF Ltd., London, United Kingdom.

JASCO (2020). Underwater Noise Impacts on Marine Fauna: Technical Appendix. (Document 02028, Version 1.1). Prepared by JASCO Applied Sciences for Santos WA Energy Ltd. (unpublished).

Jenner, K.C.S., Jenner, M.N.M. & McCabe, K.A. (2001). Geographical and temporal movements of humpback whales in Western Australian waters. APPEA Journal 2001: 749.

Jimenez-Arranz, Hedgeland,D., Cook, S., Banda,N., Johsnton,P., Oliver,E. 2020. Acoustic characterisation of a mobile offshore drilling unit. Proceedings of Meetings on Acoustics, 7-12 July 2019

Joint Group of Experts on the Scientific Aspects of Marine Pollution, 1984. Thermal discharges in the marine environment (Reports and Studies No. 24). Food and Agriculture Organization of the United Nations, Rome.

Jones, R., Wakeford, M., Currey-Randall, L., Miller, K., Tonin, H., 2021. Drill cuttings and drilling fluids (muds) transport, fate and effects near a coral reef mesophotic zone. Marine Pollution Bulletin 172, 112717

Jensen, A.S. and Silber, G.K., 2003. Large whale ship strike database. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. Technical Memorandum NMFS-OPR-25. pp.37.

Kebodeaux, T., 1994. Increased sea turtle sightings present no cause for concern. Underwater Magazine

Kennish, M.J. (ed.) (1997). Practical Handbook of Estuarine and Marine Pollution. CRC Press, Boca Raton, FL.

Keesing, J., Pitcher, R., Rochester, W., Pogonski J., Miller, M., Westlake, E., Williams, A., Althaus, F., Berry, C., Forcey, K., Mortimer, N., and Slawinski D. (2020). Santos Dorado Seabed Characterisation and Habitat Mapping. Phase 3 and Final Report. CSIRO Oceans and Atmosphere Research report to Santos Western Australia.

Kenyon R, Loneragan N, Manson F, Vance D, Venables W (2004). Allopatric distribution of juvenile red-legged banana prawns (Penaeus indicus H. Milne Edwards, 1837) and juvenile white banana prawns (Penaeus merguiensis De Man, 1888), and inferred extensive migration, in the Joseph Bonaparte Gulf, northwest Australia. Journal of Experimental Marine Biology and Ecology 309, 79–108.

Ketten, D.R., Barol, S.M., 2006. Functional measures of sea turtle hearing. Woods Hole Oceanographic Institution, Woods Hole

Kilminster, K., McMahon, K., Waycott, M., Kendrick, G.A., Scanes, P., McKenzie, L., O'Brien, K.R., Lyons, M., Ferguson, A., Maxwell, P., Glasby, T., Udy, J. (2015). Unravelling complexity in seagrass systems for management: Australia as a microcosm. Science of the Total Environment 534: 97–109. doi: 10.1016/j.scitotenv.2015.04.061.

Krause, B. (2008). Anatomy of the soundscape: evolving perspectives. The Journal of the Audio Engineering Society, 56: 73–80.

Ladich, F., Popper, A.N., 2004. Parallel Evolution in Fish Hearing Organs, in: Evolution of the Vertebrate Auditory System. Springer, pp. 95–127

Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M., 2001. Collisions between ships and whales. Marine Mammal Science 17(1): 35–75.Last, P.R. and Stevens, J.D. (2009). Sharks and Rays of Australia (Second Edition). Collingwood, Victoria: CSIRO Publishing.

Limpus, C. and Kamrowski, R.L., 2013. Ocean-finding in marine turtles: the importance of the low horizon elevation as an orientation cue. Behaviour, Vol. 150, issue 8.

Lindquist, D.C., Shaw, R.F., Hernandez Jr, F.J., 2005. Distribution patterns of larval and juvenile fishes at offshore petroleum platforms in the north-central Gulf of Mexico. Estuarine, Coastal and Shelf Science 62, 655–665.

Longcore, T., Rich, C., 2004. Ecological light pollution. Frontiers in Ecology and the Environment 2, 191–198.

Lucke, K. and C.R. McPherson (2020). Underwater Noise Impacts on Marine Fauna: Technical Appendix. Document Number 02028. Technical report by JASCO Applied Sciences for Santos WA Energy Ltd.

Lucke, K., MacGillivray, A.O., Halvorsen, M.B., Ainslie, M.A., Zeddies, D.G., Sisneros, J.A. 2022. Recommendations on bioacoustics metrics relevant for regulating exposure to anthropogenic underwater sound. Journal of the Acoustical Society of America 156(4), 2508-2526.

Mahjabin, T., Bahmanpour, M.H., Pattiaratchi, C., Hetzel, Y., Wijeratne, E.M.S and Steinberg, C. (2016). Dense Shelf Water Cascades along the North-West Australian Continental Shelf. 20th Australasian Fluid Mechanics Conference. Perth, Australia.

Marquenie, J., Donners, M., Poot, H., Steckel, W., de Wit, B., 2008. Adapting the spectral composition of artificial lighting to safeguard the environment, in: 2008 5th Petroleum and Chemical Santos Ltd | Halyard-2 Drilling & Completions Environment Plan Page 585 of 626 Industry Conference Europe-Electrical and Instrumentation Applications. Presented at the 5th Petroleum and Chemical Industry Conference Europe-Electrical and Instrumentation.

Marangoni, A., Davies, T.W., Jenkins, S.R., & Cunha, M.R. 2022, *Impacts of artificial light at night in marine ecosystems: A review*, *Global Change Biology*, 28(7): 2302–2318. DOI: 10.1111/gcb.16036.

Machovsky-Capuska, G., Huynen, L., Lambert, D. Raubenheimer, D. (2011). UVS is rare in seabirds. Vision research. 51. 1333-7. 10.1016/j.visres.2011.04.008.

Matthews, M.-N.R. and M. Zykov. 2013. Underwater Acoustic Modeling of Construction Activities: Marine Commerce South Terminal in New Bedford, MA. JASCO Document 00420, Version 6.0. Technical report by JASCO Applied Sciences for Apex Companies, LCC.

McMahon, K., Statton, J., Lavery, P., 2017. Seagrassess of the northwest of Western Australia: biogeography and considerations for dredging-related reserach (Theme 5 | Project No. 5.1.2). Western Australian Marine Science Institution, Perth.

McPherson, C.R. (2020). Assessment of survey equipment and positioning equipment for the Barossa GEP Installation. (Document 01977). Technical report by JASCO Applied Sciences for ConocoPhillips.

McCauley, R., 1998. Radiated underwater noise measured from the drilling rig Ocean General, rig tenders Pacific Ariki and Pacific Frontier, fishing vessel Reef Venture and natural sources in the Timor Sea, Northern Australia. (Report No. C98-20). Centre for Marine Science and Technology, Curtin University of Technology, Perth.

McCauley, R.D., Fewtrell, J., Duncan, A.J., Jenner, C., Jenner, M.-N., Penrose, J.D., Prince, R.I., Adhitya, A., Murdoch, J., McCabe, K., 2000. Marine seismic surveys: Analysis and propagation of airgun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid (Report No. R99-15). Centre for Marine Science and Technology, Curtin University of Technology, Perth.

McGrath J.A., C. Fanelli, D.M. Di Toro, T.F. Parkerton, A.D. Redman, M.L. Paumen, M. Comber, C.V. Eadsforth, and K. den Haan. 2018. Re-evaluation of target lipid model-derived HC5 predictions for hydrocarbons. Environmental Toxicology and Chemistry 37:1579-1593. DOI: 10.1002/etc.4100

McKinney, K. and Caplis, J. 2017. Evaluation of Oleophilic Skimmer Performance in Diminishing Oil Slick Thicknesses. International Oil Spill Conference Proceedings: May 2017, Vol. 2017, No. 1, pp. 1366-1381.

McKinnon, A.D., Meekan, M.G., Carleton, J.H., Furnas, M.J., Duggan, S., Skirving, W., 2003. Rapid changes in shelf waters and pelagic communities on the southern Northwest Shelf, Australia, following a tropical cyclone. Continental Shelf Research 23, 93–111.

McPherson, C. and Wood, M. 2017. Otway Basin Geophysical Operations Acoustic Modelling – Acoustic Modelling for Assessing Marine Fauna Sound Exposures. Prepared for Lattice Energy on 2 November 2017. Document 01473.

Meekan, M., Wilson, S., Halford, A., Retzel, A., 2001. A comparison of catches of fishes and invertebrates by two light trap designs, in tropical NW Australia. Marine Biology 139, 373– 381.

Milicich, M.J., 1992. Light traps: a novel technique for monitoring larval supply and replenishment of coral reef fish populations (Doctor of Philosophy). Division of Environmental Studies, Griffith University, Brisbane.

Moustaka, M., Langlois, T.J., McLean, D., Bond, T., Fisher, R., Fearns, P., Dorji, P., Evans, R.D., 2018. The effects of suspended sediment on coral reef fish assemblages and feeding guilds of north-west Australia. Coral Reefs 37, 659–673.

National Marine Fisheries Service, 2024. 2024 update to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 3). Underwater an In-Air Criteria for Onset of Auditory Injury and Temporary Threshold Shifts (NOAA Technical Memorandum No. NMFS-OPR-71). National Oceanic and Atmospheric Administration, Silver Spring.

National Marine Fisheries Service, 2018a. 2018 revision to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (NOAA Technical Memorandum No. NMFS-OPR-59 Version 2.0). National Oceanic and Atmospheric Administration, Silver Spring.

National Oceanic and Atmospheric Administration, 2019a. ESA Section 7 Consultation Tools for Marine Mammals on the West Coast | NOAA Fisheries [WWW Document]. NOAA Fisheries. URL https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/esa-section-7-consultation-tools-marine-mammals-west (accessed 7.6.20).

National Oceanic and Atmospheric Administration (NOAA). 2010. Oil and sea turtles: Biology, planning and response. National Oceanic and Atmospheric Administration, Washington. National Oceanic and Atmospheric Administration, 2014. Oil spills in mangroves: Planning & response considerations. National Oceanic and Atmospheric Administration, Washington.

NOPSEMA 2024a. Consultation in the course of preparing an environment plan. (Document number: N-04750-GL2086 A900179). NOPSEMA, Perth. Available from: www.nopsema.gov.au/sites/default/files/documents/Consultation%20in%20the%20course%20of%20preparing%20an%20Environment%20Plan.pdf

NOPSEMA 2024b. Consultation with Commonwealth agencies with responsibilities in the marine area. (Document number: N-04750-GL1887 A705589). NOPSEMA, Perth. Available from: www.nopsema.gov.au/sites/default/files/documents/Consultation%20with%20agencies%20with%20responsibilities%20in%20the%20Commonwealth%20marine%20area.pdf

NOPSEMA 2024c. Environment plan decision making. (Document number: N-04750-GL1721 A524696). NOPSEMA, Perth. Available from: www.nopsema.gov.au/sites/default/files/documents/Environment%20plan%20decision%20making%20guideline.pdf

NOPSEMA 2025a. Application of Oil Spill Modelling in Environment Plans – Information Paper (Document No: N-04750-IP2376;A128237), 10 December 2025

NOPSEMA 2025b. Oil Pollution Risk Management (Document No: N-04750-GN1488 A382148) 28 July 202. Available from https://www.nopsema.gov.au/sites/default/files/documents/Oil%20Pollution%20Risk%20Management%20%28A382148%29.pdf

NOPSEMA 2025c. Titleholder report on consultation in the preparation of an Environment Plan 21 July 2025. Available from: https://www.nopsema.gov.au/sites/default/files/documents/2025-08/N-04750-FM2281%20-%20Titleholder%20report%20on%20consultation%20in%20preparation%20of%20an%20Environment%20Plan%20%28A1185531%29.pdf. Accessed

NOPSEMA 2025d. Environment plan content requirement – Guidance Note (N-04750-GN1344 A339814). NOPSEMA, Perth. Available from: www.nopsema.gov.au/sites/default/files/documents/Environment%20Plan%20Content%20Requirements%20Guidance%20Note.pdf

National Oceans Office (NOO), 2002. Sea Country – an Indigenous perspective, The South-east Regional Marine Plan Assessment Reports.

NASEM National Academies of Sciences, Engineering, and Medicine (2020). The Use of Dispersants in Marine Oil Spill Response. Washington, DC: The National Academies Press. Accessed at: https://doi.org/10.17226/25161

Neff, J.M., 2005. Composition, environmental fates, and biological effects of water based drilling muds and cuttings discharged to the marine environment: A synthesis and annotated bibliography

Neff, J.M., 2008. Estimation of bioavailability of metals from drilling mud barite. Integrated Environmental Assessment and Management 4, 184–193.

Neff, J.M., 2010. Fate and effects of water based drilling muds and cuttings in cold water environments. Neff & Associates LLC, Duxbury.

Negri A.P., Brinkman, D.L. and Jones R., Review of entrained oil thresholds, July 2024. Report prepared for Santos. Australian Institute of Marine Science (8 pp).” https://energyproducers.au/wp-content/uploads/2024/07/Review-Entrained-Oil-Thresholds-2024-07-22.pdf

Negri, A. P., Brinkman, D. L., Flores, F., van Dam, J., Luter, H. M., Thomas, M. C., Fisher, R., Stapp, L. S., Kurtenbach, P., Severati, A., Parkerton, T. F., & Jones, R. (2021). Derivation of toxicity thresholds for gas condensate oils protective of tropical species using experimental and modelling approaches. *Marine Pollution Bulletin, 172*, 112899. https://doi.org/10.1016/j.marpolbul.2021.112899

Neuparth, T., Costa, F.O., Costa, M.H., 2002. Effects of temperature and salinity on life history of the marine amphipod Gammarus locusta. Implications for ecotoxicological testing. Ecotoxicology 11, 61–73.

Newman, S.J., Santoro, K.G. and Gaughan, D.J. (eds) (2023). Status Reports of the Fisheries and Aquatic Resources of Western Australia 2022/23: The State of the Fisheries. Department of Primary Industries and Regional Development, Western Australia.

NRC (2005). Oil Spill Dispersants: Efficacy and Effects. National Research Council, Washington DC.

NRDAMCME (1997). The CERCLA Type A Natural Resource Damage Assessment Model for Coastal and Marine Environments (NRDAMCME) Technical Documentation Vol 4, 14–42. A WWW publication accessed at http://www/doi.gov/oepc/oepcbb.html US Department of Interior, Washington, D.C.

Ortego, B., 1978. Blue-faced boobies at an oil production platform. The Auk 95: 762–763.

OSPAR (2007). Assessment of the impact on the marine environment of offshore oil and gas activity – an overview of monitoring results in the United Kingdom, the Netherlands and Norway. OSPAR Commission. Accessed at: https://www.ospar.org/documents?v=7081.

Parnell, P.E. 2003. The effects of sewage discharge on water quality and phytoplankton of Hawai'ian Coastal Waters. Marine Environmental Research, Vol. 44, pp 293-311

Pattiaratchi, C., Woo, M. (2009). The mean state of the Leeuwin current system between North West Cape and Cape Leeuwin. Journal of the Royal Society of Western Australia 92: 221–241.

Paulay G, Kirkendale L, Lambert G, Meyer C. 2002. Anthropogenic biotic interchange in a coral reef ecosystem: a case study from Guam. Pac Sci 56:403–422.

Payne, J., Andrews, C., Fancey, L., White, D., Christian, J., 2008. Potential effects of seismic energy on fish and shellfish: An update since 2003 (Research Document No. 2008/60). Fisheries and Oceans Canada, Ottawa.

Pendoley. 2014. Artificial Light at Night (ALAN)- Assessment, Measurement and Management. IUCN IOSEA, Bonn, Germany, Available at: https://www.cms.int/ioseaturtles/dugong/sites/default/files/document/IOSEASS7_lightpollution_KPendoley_for_websi te-6x.pdf

Pendoley Environmental Pty Ltd, 2017. ConocoPhillips Barossa Project – potential impacts of pipeline installation activities on marine turtles (No. J54001). Pendoley Environmental Pty Ltd, Perth.

Pendoley Environmental, 2020. Dorado FPSO light modelling (Report No. J54001 Rev A). Pendoley Environmental Pty Ltd, Perth.

Pearce, A., Phillips, B. (1988). ENSO events, the Leeuwin Current, and larval recruitment of the western rock lobster. Journal du Conseil: ICES Journal of Marine Science 45: 13–21.

Popper, A.N., Hawkins, A.D., Fay, R.R., Mann, D.A., Bartol, S.M., Carlson, T.J., Coombs, S., Ellison, W.T., Gentry, R.L., Halvorsen, M.B., Løkkeborg, S., Rogers, P., Southall, B.L., Zeddies, D.G., Tavolga, W.N., 2014. ASA S3/SC1.4 TR-2014 sound exposure guidelines for fishes and sea turtles: a technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. Springer, New York.

Purser, A. 2015. A Time Series Study of Lophelia pertusa and Reef Megafauna Responses to Drill Cuttings Exposure on the Norwegian Margin. Plos One 10:29.

Quigg, A., Farrington, J. W., Gilbert, S., Murawski, S. A., and John, V., T., 2021. A decade of GoMRI Dispersant Science: Lessons learned and recommendations for the future. Oceanography Society Vol. 34, No.1. pp 98-111.

Richardson, W.J., Greene Jr, C.R., Malme, C.I., Thomson, D.H., 1995. Marine Mammals and Noise. Academic Press, San Diego

RPS Environment and Planning, 2010. Humpback whale monitoring survey, North West Cape (Report No. M10357 Rev 0). RPS Environment and Planning Pty Ltd, Subiaco.

RPS, 2020a. Dorado marine water quality survey report (Report No. EEN19234.001 Rev 0). RPS, West Perth.

RPS, 2020b. Dorado sediment quality survey report (Report No. EEN19234.001-2 Rev 0). RPS, West Perth.

RPS, 2021 Santos Spartan Drilling Discharges. RPS.

RPS, 2025. Santos Bedout Multi Well Oil Spill Modelling. GOC361850. RPS, Robina Qld.

Rye, H., Reed, M., Frost, T.K., Røe Utvik, T.I., 2006. Comparison of the ParTrack mud/cuttings release model with field data based on use of synthetic-based drilling fluids. Environmental Modelling & Software 21, 190–203. https://doi.org/10.1016/j.envsoft.2004.04.018

Salmon, M., 2003. Artificial night lighting and sea turtles. Biologist 50, 163–168.

Salmon, M., Reiners, R., Lavin, C., Wyneken, J., 1995a. Behavior of loggerhead sea turtles on an urban beach. I. Correlates of nest placement. Journal of Herpetology 560–567.

Salmon, M., Tolbert, M.G., Painter, D.P., Goff, M., Reiners, R., 1995b. Behavior of loggerhead sea turtles on an urban beach. II. Hatchling orientation. Journal of Herpetology 568–576

Salmon, M., Wyneken, J., 1987. Orientation and swimming behavior of hatchling loggerhead turtles Caretta caretta L. during their offshore migration. Journal of Experimental Marine Biology and Ecology 109, 137–153.

Salgado-Kent, C., Jenner, C., Jenner, M., Bouchet, P., Rexstad, E., 2012. Southern Hemisphere breeding stock D humpback whale population estimates from North West Cape, Western Australia. Journal of Cetacean Research and Management 12, 29–38

Scholz, D., Michel, J., Hayes, M.O., Hoff, R. and Shigenaka, G. (1992). 'Biological resources', an introduction of coastal habitats and biological resources for oil spill response. Prepared for the Hazardous Materials Response and Assessment Division, NOAA, Seattle, Washington (HMRAD Report 92-4).

Sekiguchi, Y., Kohshima, S., 2003. Resting behaviors of captive bottlenose dolphins (Tursiops truncatus). Physiology & behavior 79, 643–653.

Silber, G. K.,and S. Bettridge. 2012. An assessment of the final rule to implement vessel speed restrictions to reduce the threat of vessel collisions with North Atlantic right whales. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-48.

Simmonds, M., Dolman, S., Weilgart, L. (Eds.), 2004. Oceans of noise, WDCS Science Report. Whale and Dolphin Conservation Society, Chippenham.

Smit, M.G.D., Holthaus, K.I.E., Kaag, N.B.H.M., Jak, R.G., 2006. The derivation of a PNEC-water for weighting agents in drilling mud (ERMS Report No. 6), Environmental Risk Management System. TNO Built Environment and Geosciences, Apeldoorn

Smit, M.G., Holthaus, K.I., Trannum, H.C., Neff, J.M., Kjeilen-Eilertsen, G., Jak, R.G., Singsaas, I., Huijbregts, M.A., Hendriks, A.J., 2008. Species sensitivity distributions for suspended clays, sediment burial, and grain size change in the marine environment. Environmental Toxicology and Chemistry 27, 1006–1012.

Smyth, Dermot (2007) Dhimurru Indigenous Protected Area: sole management with partners. In T Bauman and D Smyth (eds) Indigenous Partnerships in Protected Area Management: Three case studies. Australian Institute of Aboriginal and Torres Strait Islander Studies pp.100-126. doi: https://aiatsis.gov.au/sites/default/files/research_pub/indigenous-partnerships-in-protected-area-management_3.pdf.

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P., Tyack, P.J., 2019a. Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals 45, 125–232.

Southall, B.L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P., Tyack, P.J., 2019b. Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals 45, 125–232.

Threatened Species Scientific Committee (TSSC), 2008a. Approved conservation advice for green sawfish. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Threatened Species Scientific Committee (TSSC), 2010a. Approved conservation advice for *Aipysurus foliosquama* (leaf-scaled sea snake). DSEWPaC, Canberra.

Threatened Species Scientific Committee (TSSC), 2010b. Approved conservation advice for *Aipysurus apraefrontalis* (short-nosed sea snake). DSEWPaC, Canberra.

Threatened Species Scientific Committee (TSSC), 2011. Conservation advice for *Sternula nereis nereis* (Fairy tern). Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Threatened Species Scientific Committee (TSSC), 2013. Approved conservation advice for *Rostratula australis* (Australian painted snipe). TSSC, Canberra.

Threatened Species Scientific Committee (TSSC), 2014. Conservation advice *Phaethon lepturus fulvus* white-tailed tropicbird (Christmas Island). TSSC, Canberra.

Threatened Species Scientific Committee (TSSC), 2015a. Conservation advice *Calidris ferruginea* curlew sandpiper. TSSC, Canberra.

Threatened Species Scientific Committee (TSSC), 2015b. Conservation Advice for *Calidris acuminata* (sharp-tailed sandpiper). TSSC, Canberra.

Threatened Species Scientific Committee, (2015a). Conservation Advice *Megaptera novaeangliae* Humpback Whale, Threatened Species Scientific Committee, Canberra.

Threatened Species Scientific Committee, (2015c). Conservation Advice *Balaenoptera physalus* fin whale. Threatened Species Scientific Committee, Canberra.

Threatened Species Scientific Committee (TSSC), 2016b. Conservation advice *Limosa lapponica menzbieri* bar-tailed godwit (northern Siberian). TSSC, Canberra.

Threatened Species Scientific Committee (TSSC), 2020a. Conservation Advice *Neophoca cinerea* (Australian Sea Lion). Department of Agriculture, Water and the Environment, Canberra.

Threatened Species Scientific Committee (TSSC), 2020b. Conservation Advice for the Abbott's Booby – *Papasula abbotti.* Department of Agriculture, Water and the Environment, Canberra.

Thums, M., Whiting, S. D., Reisser, J. W., Pendoley, K. L., Pattiaratchi, C. B., Harcourt, R. G., et al. 2013. Tracking sea turtle hatchlings – A pilot study using acoustic telemetry. J. Exp. Mar. Bio. Ecol. 440, 156–163. doi: 10.1016/j.jembe.2012.12.006

Thums, M., Jenner, C., Waples, K., Salgado-Kent, C., Meekan, M., 2018. Humpback whale use of the Kimberley: understanding and monitoring spatial distribution (KMRP Report No. Project 1.2.1), WAMSI Kimberley Marine Research Program. Western Australian Marine Science Institution, Perth.

Thums, M., C. Ferreira, L., Jenner, C., Jenner, M., Harris, D., Davenport, A., Andrews-Goff, V., Double, M., Möller, L., Attard, C.R.M., Bilgmann, K., G. Thomson, P., McCauley, R., 2022. Pygmy blue whale movement, distribution and important areas in the Eastern Indian Ocean. Global Ecology and Conservation 35, e02054. https://doi.org/10.1016/j.gecco.2022.e02054

Trannum, H.C., Nilsson, H.C., Schaanning, M.T., Øxnevad, S., 2010. Effects of sedimentation from water-based drill cuttings and natural sediment on benthic macrofaunal community structure and ecosystem processes. Journal of Experimental Marine Biology and Ecology 383, 111–121. https://doi.org/10.1016/j.jembe.2009.12.004

United Nations, 2021. Globally harmonized system of classification and labelling of chemicals (GHS) (Report No. ST/SG/AC.10/30/Rev.9). United Nations, New York.

Victorian Aboriginal Heritage Council (VAHC), 2021. Taking Care of Culture, State of Victoria's Aboriginal Cultural Heritage Report. doi: https://www.aboriginalheritagecouncil.vic.gov.au/taking-care-culture

Wahab, M.A.A., Radford, B., Cappo, M., Colquhoun, J., Stowar, M., Depczynski, M., Miller, K., Heyward, A. (2018). Biodiversity and spatial patterns of benthic habitat and associated demersal fish communities at two tropical submerged reef ecosystems. Coral Reefs 1–17. doi:https://doi.org/10.1007/s00338-017-1655-9.

Waite, A.M., Thompson, P., Pesant, S., Feng, M., Beckley, L., Domingues, C., Gaughan, D., Hanson, C., Holl, C., Koslow, T., Meuleners, M., Montoya, J., Moore, T., Muhling, B., Paterson, H., Rennie, S., Strzelecki, J., Twomey, L. (2007). The Leeuwin Current and its eddies: An introductory overview. Deep Sea Research Part II: Topical Studies in Oceanography 54: 789–796.

Walker, D.I., & McComb, A.J. (1990). Salinity response of the seagrass *Amphibolis antarctica* (Labill.) Sonder et Aschers.: an experimental validation of field results. Aquatic Botany, 36(4), 359-366.

Walkuska, G., Wilczek, A., 2010. Influence of discharged heated water on aquatic ecosystem fauna. Polish Journal of Environmental Studies 19.

Water Quality Australia (2018). Australian and New Zealand guidelines for fresh and marine water quality, online platform. Available at: https://www.waterquality.gov.au/guidelines/anz-fresh-marine.

Weilgart, L.S., 2007. A brief review of known effects of noise on marine mammals. International Journal of Comparative Psychology 20, 159–168.

Wells, F.E., McDonald, J.I., Huisman, J.M., 2009. Introduced marine species in Western Australia (Fisheries Occasional Publication No. 57). Department of Fisheries, Perth.

Whale and Dolphin Conservation Society (WDCS), 2006. Vessel Collisions and Cetaceans: What happens when they don't miss the boat. Whale and Dolphin Conservational Society. United Kingdom.

Whittock, P.A., Pendoley, K.L., Hamann, M., 2016. Using habitat suitability models in an industrial setting: the case for internesting flatback turtles. Ecosphere 7, e01551. https://doi.org/10.1002/ecs2.1551

Wilson, P., Thums, M., Pattiaratchi, C., Meekan, M., Pendoley, K., Fisher, R., Whiting, S., 2018. Artificial light disrupts the nearshore dispersal of neonate flatback turtles Natator depressus. Marine Ecology Progress Series 600, 179–192.

Woodside Energy Limited, 2011. Browse LNG Development Draft Upstream Environmental Impact Statement (No. EPBC Referral 2008/4111). Woodside Energy Limited, Perth.

Woodside Energy Limited, 2019. WA-34-L Pyxis Drilling and Subsea Installation Environment Plan. Woodside Burrup Pty Ltd.

Woodside Energy Limited, 2024. Angel Operations Environment Plan, Woodside Pty Ltd.

Wolanski, E., 1994. Physical oceanographic processes of the Great Barrier Reef, CRC Marine Science. CRC Press, Boca Raton.

# Appendix A Santos Environment Policy

Santos

# Environment

## Policy

## Our Commitment

Santos is committed to minimising our environmental impact.

## Our Actions

We will:

1. Integrate environmental management requirements into the way we work, including measures for biodiversity, emissions and air quality, and waste and water management
2. Comply with all relevant environmental laws and continuously improve our management systems
3. Include environmental considerations in business planning, decision making and asset management processes
4. Identify, control and monitor risks that have the potential for environmental impact, so far as is reasonably practicable, applying the mitigation hierarchy (avoid, minimise, restore, offset)
5. Report, investigate and learn from our incidents
6. Consult and communicate with, and promote the participation of, all workers to maintain a strong environmental culture
7. Provide training for employees to understand the impacts of the company's activities on the environment
8. Work proactively and collaboratively with our stakeholders and the communities in which we operate
9. Not undertake new exploration activities within the boundaries of natural sites on the World Heritage List (as specified on 19 August 2025)
10. Set, measure, review and monitor objectives and targets to demonstrate proactive risk reduction processes are in place and support a continuous improvement approach to managing environmental impacts
11. Report publicly on our environmental performance

## Governance

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

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

This policy applies to employees and contractors as defined in the Santos Code of Conduct.

Kevin Gallagher

**Managing Director and CEO**

| | | | |
|---|---|---|---|
| Document Owner: | Steve Trench, EVP Operations and Technical Services | | |
| Approved by: | The Board | | |
| Date Approved: | 19 August 2025 | Version: | 1 |

# Appendix B Legislative Framework

## Australian Legislation

| Legislation | Summary | Relevant to Activity? | Administering Authority | Relevant aspects of the activity | EP Section |
|---|---|---|---|---|---|
| **Commonwealth** | | | | | |
| *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* | This Act provides for the preservation and protection from injury or desecration areas and objects that are of significance to Aboriginal people, under which the Minister may make a declaration to protect such areas and objects. The Act also requires the discovery of Aboriginal remains to be reported to the Minister. | Yes | Commonwealth – Department of Climate Change, Energy, the Environment and Water<br>and<br>The Attorney-General | There are no known sites of Aboriginal Heritage Significance within the OA but it is present within the wider EMBA.<br>This Act would only apply to the activity if there was a discovery of Aboriginal remains, which is not considered likely to occur given the offshore location of the activity. | Section 3.2.5 – Protected and significant areas<br>Section 3.2.7 – Socio-economic receptors |
| Australian Ballast Water Requirements, Version 8 | Australian Ballast Water Management Requirements outline the mandatory ballast water management requirements to reduce the risk of introducing harmful aquatic organisms into Australia's marine environment through ballast water from international vessels. These requirements are enforceable under the *Biosecurity Act 2015*. | Yes | Commonwealth – Department of Agriculture, Fisheries and Forestry | Potential internationally sourced vessel operating in Australian Waters which could have the potential for introduction of Invasive Marine Species and potential ballast water exchange. | Section 7.2 – Introduction of Invasive Marine Species |
| *Australian Heritage Council Act 2003* | This Act identifies areas of heritage value listed on the Register of the National Estate and sets up the Australian Heritage Council and its functions. | Yes | Australian Heritage Council | There are no national heritage places within the operational areas. National Heritage listed places are present in the EMBA. | Section 3.2.5 – Protected and significant areas |
| *Australian Maritime Safety Authority Act 1990* (AMSA Act) | This Act specifies that AMSA's role includes protection of the marine environment from pollution from ships and other environmental damage caused by shipping. AMSA is responsible for administering the Marine Order in Commonwealth Waters.<br>This Act facilitates international cooperation and mutual assistance in preparing and responding to a major oil spill incident and encourages countries to develop and maintain an adequate capability to deal with oil pollution emergencies. Requirements are given effect through AMSA. | Yes | AMSA | This Act applies to the use of any vessel associated with operations and is relevant to the activity in regard to the unplanned pollution from ships. | Section 7.7 – Hydrocarbon spill (MDO) |

| Legislation | Summary | Relevant to Activity? | Administering Authority | Relevant aspects of the activity | EP Section |
|---|---|---|---|---|---|
| | AMSA is the lead agency for responding to oil spills in the marine environment and is responsible for the Australian National Plan for Maritime Environmental Emergencies. | | | | |
| *Aquatic Resources Management Act 2016* | This Act will be the primary legislation used to manage fishing, aquaculture, pearling, and aquatic resources in Western Australia.<br>The Act was scheduled for commencement on 1 January 2019; however, this has been deferred while an amendment to the Act is progressed | Yes | Department of Primary Industries and Regional Development<br>in conjunction with<br>Department of Agriculture, Fisheries and Forestry | Vessel movements have the potential to introduce invasive marine species (IMS). This Act was considered during development of the Santos IMS Management Zone and IMS Management Plan. | Section 7.2 – Introduction of invasive marine species |
| *Marine Orders* | Marine Orders (MO) are subordinate rules made pursuant to the *Navigation Act 2012* and *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* affecting the maritime industry. They are a means of implementing Australia's international maritime obligations by giving effect to international conventions in Australian law. | Yes | AMSA | Vessel movements, safety, discharges, and emissions | Sections 6 and 7 – Planned and unplanned events. |
| *Maritime Powers Act 2013* | The *Maritime Powers Act 2013* provides the enforcement provisions for all maritime law enforcement matters. It also establishes a range of appropriate safeguards for the exercise of maritime powers. | No | Maritime officers from a range of agencies, such as<br>ABF, ADF, AFP and AFMA, may exercise powers under<br>the Act. | This purpose for which maritime powers can be exercised include:<br>• investigate a contravention of any Australian law<br>• administer or ensure compliance with fisheries, customs and migration laws<br>• administer or ensure compliance with an international agreement designated in the regulations or by the Minister. | NA |
| *Biosecurity Act 2015*<br>Biosecurity Regulations 2016 | 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 | Yes | Commonwealth – Department of Agriculture, Fisheries and Forestry | This Act applies to all internationally sources vessels operating in Australian Waters which could have the potential for the introduction of IMS and potential ballast water exchange. | Section 7.2 – Introduction of invasive marine species. |

| Legislation | Summary | Relevant to Activity? | Administering Authority | Relevant aspects of the activity | EP Section |
|---|---|---|---|---|---|
| | native flora and fauna or natural environment. The Commonwealth's powers include powers of entry, seizure, detention and disposal.<br>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.<br>The Biofouling Amendment Regulations requires operators of all vessels to provide information on biofouling management practices prior to arriving in Australia, | | | | |
| *Corporations Act 2001* | This Act is the principal legislation regulating matters of Australian companies, such as the formation and operation of companies, duties of officers, takeovers, and fundraising. | Yes | Commonwealth – Australian Securities and Investments Commission | The titleholder has provided ACN details within the meaning of the Act. | Section 1.4 – Titleholder |
| *Environment Protection and Biodiversity Conservation Act 1999*<br><br>EPBC Amendment Regulations 2006 | NOPSEMA is the sole assessor for offshore petroleum activities in Commonwealth water (as of 28 February 2014). Under the new arrangements, environmental protection will be met through NOPSEMA's decision-making processes.<br>This Act is the Australian Government's key piece of environmental legislation. The Act focuses on protecting MNES. AMP Management Plans were also developed under this Act. | Yes | Commonwealth – Department of Climate Change, Energy, the Environment and Water | This Act applies to all aspects of the activity that have the potential to impact MNES. Appropriate environmental approvals will be sought from NOPSEMA for all operations (this EP) which outlines compliance with the relevant regulations and plans under the Act.<br>Where activities have existing approvals under the Act, these will continue to apply. | Section 6.4 – Noise emissions<br>Section 6.3 – Light emissions<br>Section 6.7 – Drilling discharges<br>Section 6.6 – Planned chemical discharges<br>Sections 7.6 and 7.7 – Hydrocarbon release |
| *Hazardous Waste (Regulation of Exports and Imports) Act 1989* | The main purpose of the Hazardous Waste (Regulation of Exports and Imports) Act 1989 ('the Act') is to regulate the export, import and transit of hazardous waste to ensure that hazardous waste is dealt with appropriately so that human beings and the environment, both within and outside | Yes | Commonwealth – Department of Climate Change, Energy, the Environment and Water | Management of recovered equipment as its brought onto shore for appropriate recycling or disposal. | Section 1.5.1 – Environment Policy |

| Legislation | Summary | Relevant to Activity? | Administering Authority | Relevant aspects of the activity | EP Section |
|---|---|---|---|---|---|
| | Australia, are protected from the harmful effects of the waste. | | | | |
| *Industrial Chemicals Act 2019*<br><br>Industrial Chemicals Categorisation Guidelines<br>01 September 2025 | The *Industrial Chemicals Act 2019* is the Australian law that regulates the importation and manufacture of industrial chemicals in Australia. | Yes | Department of Health | This regulation aims to ensure the safe introduction of industrial chemicals— either through importation or domestic manufacturing—by assessing potential risks and implementing appropriate controls. | Section 2.5 – Chemical Assessment |
| *National Greenhouse and Energy Reporting Act 2007* | Introduces a single national reporting framework for the reporting and dissemination of information about greenhouse gas emissions, greenhouse gas projects and energy use and production of corporations. | Yes | Commonwealth – Department of Climate Change, Energy, the Environment and Water | This Act applies to the atmospheric emissions through combustion engine use to operate the vessels associated with the activity.<br>Implementation of the Act will reduce the impact of GHG emissions associated with vessel use for the installation and pre-commissioning activity, through compliance with MARPOL Annex VI (Marine Order Part 97: Marine Pollution Prevention – Air Pollution) and require the use of low sulphur fuel. | Section 6.5 – Atmospheric emissions |
| *Climate Change Act 2022 (Cth)* | The Climate Act commenced in September 2022. The Climate Act sets out Australia's net zero commitments and codifies Australia's net 2030 and 2050 GHG emissions reductions targets under the Paris Agreement.<br>While the oil and gas sector is not subject to direct obligations under this Act, the Act legislates Australia's net zero emissions targets. | No | Climate Change Authority | N/A | N/A |
| *Marine Safety (Domestic Commercial Vessel) National Law Act 2012* | This Act is a single regulatory framework for the certification, construction, equipment, design, and operation of domestic commercial vessels inside Australia’s exclusive economic zone. | Yes | Commonwealth – Australian Maritime Safety Authority | All vessel movements associated with the activity will be governed by AMSA marine safety regulations under the Act. | Section 6.1 – Interaction with other marine users<br>Section 7.7 – Hydrocarbon spill MDO |

| Legislation | Summary | Relevant to Activity? | Administering Authority | Relevant aspects of the activity | EP Section |
|---|---|---|---|---|---|
| *Navigation Act 2012* | An Act regulating navigation and shipping including SOLAS. A number of Marine Orders enacted under this Act apply directly to offshore petroleum exploration and production activities:<br>• Marine Order 21: Safety and Emergency Arrangements<br>• Marine Order 27: Safety of Navigation and Radio Equipment<br>• Marine Order 30: Prevention of collisions<br>• Marine Order 47: Offshore industry units<br>• Marine Order 58: Safe Management of Vessels<br>• Marine Order 70: Seafarer Certification | Yes | AMSA (operational)<br>Department of Infrastructure, Transport, Regional Development, Communications, Sport and the Arts | All vessel movements associated with the activity will be governed by marine safety regulations and Marine Orders under the Act. | Section 6.1 – Interaction with other marine users<br>Section 7.7 – Hydrocarbon spill MDO |
| *Offshore Petroleum and Greenhouse Gas Storage Act 2006*<br>Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 | Petroleum exploration and development activities in Australia's offshore areas are subject to the environmental requirements specified in the OPGGS Act and associated Regulations. The OPGGS Act contains a broad requirement for titleholders to operate in accordance with "good oil-field practice". Specific environmental provisions relating to work practices essentially require operators to control and prevent the escape of wastes and petroleum.<br>The Act also requires that activities are carried out in a manner that does not unduly interfere with other rights or interests, including the conservation of the resources of the sea and sea bed, such as fishing or shipping. In some cases, where there are particular environmental sensitivities or multiple use issues it may be necessary to apply special conditions to an exploration permit area. The holder of a petroleum title must maintain adequate insurance | Yes | NOPSEMA | The activity involves exploration drilling and appraisal drilling activities which are petroleum activities regulated by NOPSEMA under this Act. | Section 6 – Risk Assessments for Planned Events<br>Section 7 – Risk Assessments for Unplanned Events |

| Legislation | Summary | Relevant to Activity? | Administering Authority | Relevant aspects of the activity | EP Section |
|---|---|---|---|---|---|
| | against expenses or liabilities arising from activities in the title, including expenses relating to clean-up or other remedying of the effects of the escape of petroleum.<br>The OPGGS Environment Regulations provide an objective based regime for the management of environmental performance for Australian offshore petroleum exploration and production activities in areas of Commonwealth jurisdiction. Key objectives of the Environment Regulations include:<br>to ensure operations are carried out in a way that is consistent with the principles of ecologically sustainable development<br>to adopt best practice to achieve agreed environment protection standards in industry operations<br>to encourage industry to continuously improve its environmental performance. | | | | |
| *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989* | Regulates the manufacture, importation, and use of ozone depleting substances (typically used in fire-fighting equipment and refrigerants). Applicable to the handling of any ODS. | Yes | Commonwealth – Department of Climate Change, Energy, the Environment and Water | The activity does not include import, export, or manufacture activities of ODS.<br>This Act applies where ODS is found on vessel refrigeration systems; however, this is a rare occurrence. | Section 6.5 – Atmospheric emissions |
| *Protection of the Sea (Powers of Intervention) Act 1981*<br><br>Protection of the Sea (Powers of Intervention) Regulations 1983 | The 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. | Yes | Commonwealth – Department of Infrastructure, Transport, Regional Development, Communications, Sport and the Arts | This Act applies to vessel discharges and movements associated with the activity.<br>The Act is relevant to the extent that Santos will comply with MARPOL through the following relevant Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78:<br>• Marine Order 91: Marine Pollution Prevention – Oil | Section 6.1 – Interaction with other marine users<br>Section 6.6 – Planned operational discharges<br>Sections 7.6 and 7.7 – Unplanned hydrocarbon and hydrocarbon.<br>Section 7.2 – Introduction of IMS |

| Legislation | Summary | Relevant to Activity? | Administering Authority | Relevant aspects of the activity | EP Section |
|---|---|---|---|---|---|
| | | | | • Marine Order 93: Marine Pollution Prevention – Noxious Liquid Substances<br>• Marine Order 94: Marine Pollution Prevention – Packaged Harmful Substances<br>• Marine Order 95: Marine Pollution Prevention – Garbage<br>• Marine Order 96: Marine Pollution Prevention – Sewage. | |
| *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*<br><br>Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994 | This Act relates to the protection of the sea from pollution by oil and other harmful substances discharged from ships. This Act disallows any harmful discharge of sewage, oil and noxious substances into the sea and sets the requirements for a shipboard waste management plan. The following Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78:<br>• Marine Order 91: Marine Pollution Prevention – Oil<br>• Marine Order 93: Marine Pollution Prevention – Noxious Liquid Substances<br>• Marine Order 94: Marine Pollution Prevention – Packaged Harmful Substances<br>• Marine Order 95: Marine Pollution Prevention – Garbage<br>• Marine Order 96: Marine Pollution Prevention – Sewage<br>• Marine Order 97: Marine Pollution Prevention – Air Pollution. | Yes | Commonwealth – Department of Infrastructure and Regional Development | This Act applies to vessel discharges and movements associated with the activity.<br>The Act is relevant to the extent that Santos will comply with MARPOL through the following relevant Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78:<br>• Marine Order 91: Marine Pollution Prevention – Oil<br>• Marine Order 93: Marine Pollution Prevention – Noxious Liquid Substances<br>• Marine Order 94: Marine Pollution Prevention – Packaged Harmful Substances<br>• Marine Order 95: Marine Pollution Prevention – Garbage<br>• Marine Order 96: Marine Pollution Prevention – Sewage. | Section 6.1 – Interaction with other marine users<br>Section 6.6 – Planned operational discharges<br>Sections 7.6 and 7.7 – Unplanned hydrocarbon and hydrocarbon.<br>Section 7.2 – Introduction of IMS |
| *Protection of the Sea (Civil Liability of Bunker Oil Pollution Damage) Act 2008* | This Act implements the requirements for the International Convention on Civil Liability for Bunker Oil Pollution Damage. | Yes | AMSA | This Act applies to diesel refuelling which may be undertaken at sea as part of the activity. Compliance with | Section 7.7 – Hydrocarbon spill – marine diesel oil |

| Legislation | Summary | Relevant to Activity? | Administering Authority | Relevant aspects of the activity | EP Section |
|---|---|---|---|---|---|
| | | | | the Act reduces the risk of bunker oil pollution. | |
| *Protection of the Sea (Harmful Antifouling Systems) Act 2006* | This Act relates to the protection of the sea from the effects of harmful anti-fouling systems. It prohibits the use of harmful organotin in ant-fouling paints used on ships.<br>This is enacted by Marine Order 98 (Marine Pollution – Anti-fouling Systems) 2013. | Yes | Commonwealth, Department of Infrastructure, Transport, Regional Development, Communications, Sport and the Arts<br>and<br>AMSA | This Act applies to vessel movements in Australian Waters associated with the activity. Vessels are required to have biofouling systems in place to prevent introduction of IMS/harmful impact on Australian biodiversity.<br>This is enacted by Marine Order 98 (Marine Pollution – Anti-fouling Systems) 2013. | Section 7.2 – Introduction of IMS |
| *Underwater Cultural Heritage Act 2018* | This Act replaces the Historic Shipwrecks Act 1976 and extends protection to other wrecks such as submerged aircraft and human remains. It also increases penalties applicable to damaged sites. The Act came into effect on 1 July 2019. | Yes | | No planned interaction or interference to shipwrecks. Potential impact could be due to a hydrocarbon spill, however, shipwrecks are unlikely to be impacted. Numerous shipwrecks identified within EMBA. | Sections 7.6 and 7.7 – Hydrocarbon release |
| **State Legislation** | | | | | |
| *Biodiversity Conservation Act 2016* | The Biodiversity Conservation Act 2016 (WA) is the legislation that provides DBCA with the responsibility and Statutory Authority to treat, protect, and destroy wildlife. In State waters, DBCA is the Jurisdictional Authority for Oiled Wildlife Response (OWR), providing advice to the Control Agency (DTMI). | N/A | Department of Biodiversity, Conservation and Attractions | This Act will apply for a Level 2/3 petroleum spill that moves into State waters | N/A |
| *Fish Resources Management Act 1994*<br>Fish Resources Management Regulations 1995 | This Act establishes a framework for management of fishery resources and is the nominated lead agency responsible for implementing Western Australian marine biosecurity management requirements through implementation of the *Fish Resources Management Act 1994* (FRMA 1994) and associated regulations. | Yes | Department of Primary Industries and Regional Development | Introduction of invasive marine species. | Section 7.2 – Introduction of IMS |

## International Agreements and Conventions

| International Agreements and Conventions | Summary | Relevant to Activity | Relevant Aspects | EP Section |
|---|---|---|---|---|
| 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 | Implemented in WA Marine (Sea Dumping) Act and *Environmental Protection (Sea Dumping) Act 1981*. | Yes | Sewage, grey water, and putrescible wastes generated from vessels.<br>Deck drainage/deck wash-down, cooling, brine, ballast, and bilge water from support vessels. | Section 6.6 – Planned operational discharges |
| Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and Their Environment 1974 (commonly referred to as the Japan Australia Migratory Bird Agreement or JAMBA) | This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and Japan. Implemented in EPBC Act. | Yes | Only relevant in so far as the credible spill scenario may result in impact to migratory seabirds foraging in area. | Sections 7.6 and 7.7 – Hydrocarbon release |
| Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and Their Environment 1986 (commonly referred to as the China Australia Migratory Bird Agreement or CAMBA) | This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and China. Implemented in EPBC Act. | Yes | Only relevant in so far as the credible spill scenario may result in impact to migratory seabirds foraging in area. | Sections 7.6 and 7.7 – Hydrocarbon release |
| Convention for the Control of Transboundary Movements of Hazardous Wastes and Their Disposal 1989 (Basel Convention) | This convention deals with the transboundary movement of hazardous wastes, particularly by sea. Implemented in *Hazardous Waste (Regulation of Exports and Imports) Act 1989*. | No | Activity will be compliant with any transboundary movement requirements on hazardous waste. | Section 6.6 – Planned operational discharges |
| United Nations Convention on Biological Diversity – 1992 | An international treaty to sustain life on earth. | Yes | Relevant only insofar as the activity may interact with MNES (threatened and migratory species) protected under the EPBC Act. | Section 6.2 – Seabed disturbance<br>Section 6.3 – Light emissions<br>Section 6.4 – Noise emissions<br>Section 7.3 – Interaction with marine fauna<br>Sections 7.6 to 7.8 – Unplanned hydrocarbon and non-hydrocarbon/ chemical spills |
| Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (OPRC 90) | This convention comprises national arrangements for responding to oil pollution incidents from ships, offshore oil facilities, sea ports and oil handling. The convention recognises that in the event of pollution incident, prompt and effective action is essential. | Yes | In the event that worse-case credible spill scenarios may enact a national arrangement for response. | Sections 7.6 and 7.7 – Hydrocarbon release<br>Section 6.8 – Spill response operations |

| International Agreements and Conventions | Summary | Relevant to Activity | Relevant Aspects | EP Section |
|---|---|---|---|---|
| Convention on the Conservation of Migratory Species of Wild Animals 1979 (Bonn Convention) | The Bonn Convention aims to improve the status of all threatened migratory species through national action and international agreements between range states of particular groups of species. | Yes | Only relevant in so far as the credible spill scenario may result in impact to MNES protected migratory species. | Section 7.6 – Hydrocarbon release<br>Section 6.8 – Spill response operations |
| International Convention for the Establishment of an International Fund for Compensation for Oil Pollution Damage (Fund 92) | This convention ensures compensation is provided for damage caused by oil pollution. | No | Relevant to oil tankers, not supply or support vessels. | N/A |
| International Convention for the Prevention of Pollution from Ships 1973/1978 (MARPOL 73/78) | This Convention and Protocol (together known as MARPOL 73/78) build on earlier conventions in the same area. MARPOL is concerned with operational discharges of pollutants from ships. It contains six Annexes, dealing respectively with oil, noxious liquid substances, harmful packaged substances, sewage, garbage and air pollution. Detailed rules are laid out as to the extent to which (if at all) such substances can be released in different sea areas. The legislation giving effect to MARPOL in Australia is the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, the *Navigation Act 2012* and several Parts of Marine Orders made under this legislation. | Yes | Already dealt with through the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 – refer to legislation table. | N/A |
| International Convention for the Safety of Life at Sea 1974 | This convention is generally regarded as the most important of all international treaties concerning the safety of merchant ships Implemented in the *Air Navigation Act 1920.* | Yes | Only relevant in so far as SOLAS relates to safety aspects of the activity, such as navigation aids which reduce potential for vessel collision and hydrocarbon release to the environment. | Section 6.1 – Interaction with other marine users |
| International Convention on Civil Liability for oil pollution damage (1969) | This convention provides a mechanism for ensuring the payment of compensation for oil pollution damage. | No | Relevant to oil tankers. | N/A |
| International Convention for the Control and Management of Ships' Ballast Water and Sediments (Ballast Water Convention) 2004 | The IMO has been addressing the problem of invasive marine species in ship's ballast water since the 1980s. Ballast water and sediments guidelines were adopted in 1991 and the ballast water convention was adopted in 2004. Recent accession by Finland has triggered the final entry into force of these international requirements. As a result, the International Convention for the Control and Management of Ships Ballast Water and Sediment will enter into force on 8th September | Yes | Potential internationally sourced vessel operating in Australian Waters which could have the potential for introduction of Invasive Marine Species and potential ballast water exchange. | Section 7.2 – Introduction of invasive marine species |

| International Agreements and Conventions | Summary | Relevant to Activity | Relevant Aspects | EP Section |
|---|---|---|---|---|
| | 2017 (IMO Briefing 22 2016). It aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Ballast Water Management systems must be approved by the Administration in accordance with this IMO Guidelines. | | | |
| Minamata Convention on Mercury (Australia ratified the convention on 7 December 2021) | The Minamata Convention on Mercury is an international treaty that seeks to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds.<br>The Convention covers all aspects of the life cycle of mercury, controlling and reducing mercury across a range of products, processes, and industries. | Yes | Relevant to the contaminant limit concentrations in barite.<br>Santos have committed to H2-DC-CM-030 Quality Control limits for Barite (relevant to mercury):<br>Mercury (Hg) – 1 mg/kg dry weight in stock barite<br>Cadmium (Cd) – 3 mg/kg dry weight in stock barite | Section 6.6 – Planned operational discharges |
| United Nations Convention on the Law of the Sea (UNCLOS) (1982) | Part XII of the convention sets up a general legal framework for marine environment protection. The convention imposes obligations on State Parties to prevent, reduce and control marine pollution from the various major pollution sources, including pollution from land, from the atmosphere, from vessels and from dumping (Articles 207 to 212). Subsequent articles provide a regime for the enforcement of national marine pollution laws in the many different situations that can arise. Australia signed the agreement relating to the implementation of Part XI of the Convention in 1982, and UNCLOS in 1994. | Yes | Only relevant to the extent that Santos will comply with MARPOL through the following relevant Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78:<br>• Marine Order 91: Marine Pollution Prevention – Oil<br>• Marine Order 93: Marine Pollution Prevention – Noxious Liquid Substances<br>• Marine Order 94: Marine Pollution Prevention – Packaged Harmful Substances<br>• Marine Order 95: Marine Pollution Prevention – Garbage<br>• Marine Order 96: Marine Pollution Prevention – Sewage<br>• Marine Order 97: Marine Pollution Prevention – Air Pollution. | Section 6.6 – Planned operational discharges<br>Sections 7.6 and 7.7 – Hydrocarbon release<br>Section 7.2 – Introduction of invasive marine species |

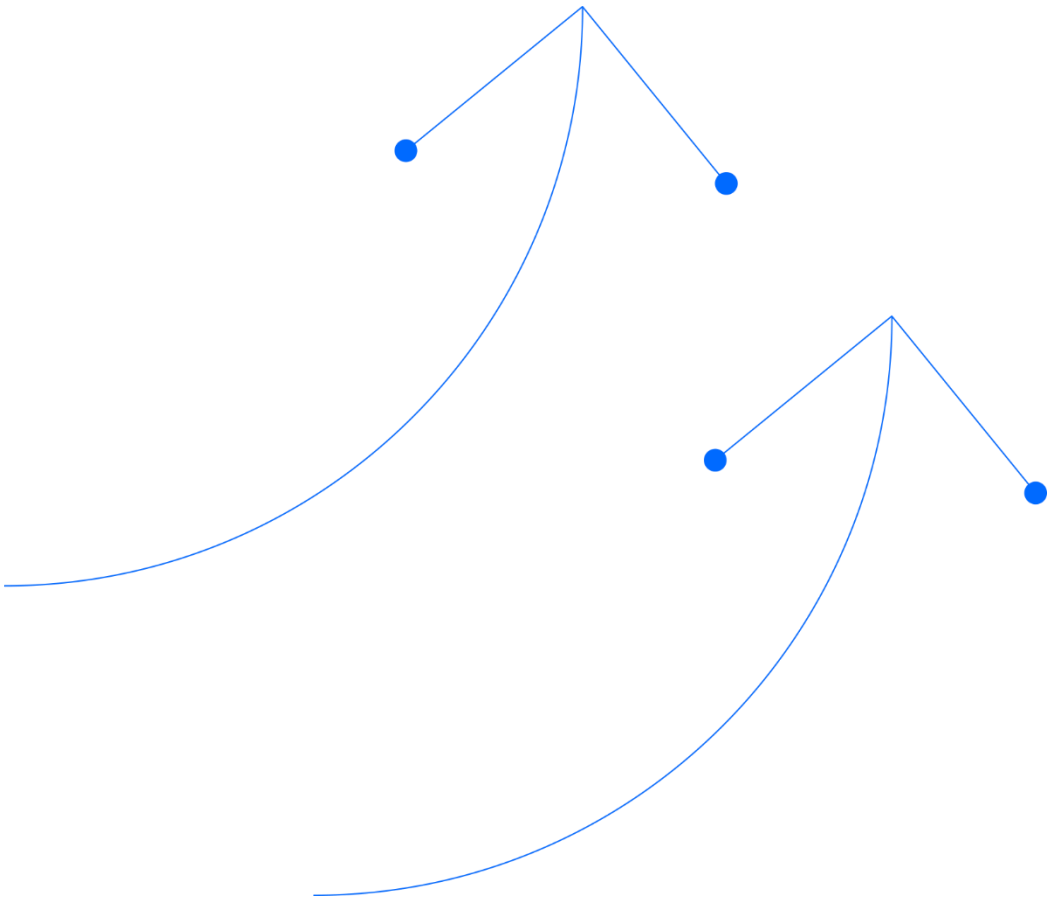
| International Agreements and Conventions | Summary | Relevant to Activity | Relevant Aspects | EP Section |
|---|---|---|---|---|
| United Nations Framework Convention on Climate Change (1992)<br><br>The Paris Agreement | The objective of the convention is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system. Australia ratified the convention in December 1992 and it came into force on 21 December 1993.<br>The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 195 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016.<br>Its overarching goal is to hold “the increase in the global average temperature to well below 2 °C above pre-industrial levels” and pursue efforts “to limit the temperature increase to 1.5 °C above pre-industrial levels.” | Yes | Only relevant to the extent that to reduce impact of GHG emissions associated with vessel use, Santos will comply with MARPOL Annex VI (Marine Orders Part 97: Marine Pollution Prevention – Air Pollution) and require the use of low sulphur fuel. The vessels will use diesel, which is a low sulphur fuel. | Section 6.5– Atmospheric emissions |

# Appendix C Bedout Basin Exploration and Appraisal Drilling Values and Sensitivities of the Marine and Coastal Environment

Santos

# BEDOUT MULTI WELL DRILLING VALUES AND SENSITIVITIES OF THE MARINE AND COASTAL ENVIRONMENT

September 2025



Santos

# BEDOUT MULTI WELL EXPLORATION AND APPRAISAL DRILLING (WA-541-P, WA-435-P & WA-436-P) VALUES AND SENSITIVITIES OF THE MARINE AND COASTAL ENVIRONMENT

| | |
|---|---|
| **Project / Facility** | All |
| **Review interval (months)** | 12 Months |
| **Safety critical document** | No |

| Rev | Owner | Reviewer(s) *Managerial/Technical/Site* | Approver |
|---|---|---|---|
| | **Environmental Consultant** | **Senior Environmental Approvals Advisor** | **Environment Manager - WANTTL** |
| D | | | |

*Any hard copy of this document, other than those identified above, is uncontrolled. Refer to the Santos Offshore Business Document Management System for the latest revision.*

| Rev | Rev Date | Author / Editor | Amendment |
|---|---|---|---|
| A | 15/11/2024 | Worley Consulting | For review |
| B | 16/05/2025 | Worley Consulting | For review |
| C | 09/07/2025 | Worley Consulting | For Review |
| D | 09/09/2025 | Worley Consulting | For Review |

Santos

# Table of contents


**1. Introduction** 7

1.1. Overview 7

1.2. Geographical Extent 7

**2. Physical Environment** 10

2.1. Geomorphology 10

2.2. Climate 12

2.3. Oceanography 14

**3. Benthic and Pelagic Habitats** 16

3.1. Coral Reefs 16

3.2. Seagrasses 20

3.3. Macroalgae 23

3.4. Non-Coral Benthic Invertebrates 25

3.5. Plankton 28

**4. Shoreline Habitats** 29

4.1. Mangroves 29

4.2. Intertidal Mud/Sand Flats 31

4.3. Intertidal Platforms 32

4.4. Sandy Beaches 33

4.5. Rocky Shorelines 34

**5. Fishes and Sharks** 35

5.1. Regional Surveys 37

5.2. Fish Species 41

5.3. Sharks, Rays and Sawfishes 41

5.4. Biologically Important Areas / Critical Habitat – Fishes and Sharks 47

**6. Marine Reptiles** 49

6.1. Marine Turtles 51

6.2. Seasnakes 63

6.3. Crocodiles 64

6.4. Biologically Important Areas/Habitat Critical – Marine Reptiles 64

**7. Marine Mammals** 66

7.1. Threatened and Migratory Species 69

7.2. Biologically Important Areas / Critical Habitat – Marine Mammals 79

**8. Birds** 81

8.1. Regional Surveys 81
8.2. Threatened Species 83
8.3. Migratory Species 91
8.4. Biologically Important Areas / Critical Habitat– Birds 98

**9. Protected Areas 100**
9.1. World Heritage Areas 100
9.2. Wetlands of National Importance 102
9.3. National Heritage Places 103
9.4. Commonwealth Heritage Places 103
9.5. Coastal Terrestrial Conservations Reserves – bound by marine waters 104
9.6. Threatened Ecological Communities 107

**10. Key Ecological Features 107**
10.1. Introduction 107

**11. State Marine Conservation Reserves 113**
11.1. Introduction 113

**12. Australian Marine Parks 118**
12.1. Introduction 118
12.2. South-West Marine Parks Network 121
12.3. North-West Marine Park Network 121

**13. Conservation Management Plans 128**
13.1. Conservation Advice 128
13.2. Recovery Plans 128

**14. Social and Economic Features 137**
14.1. Industry 137
14.2. Other Infrastructure 137
14.3. Shipping 137
14.4. Defence Activities 139
14.5. Tourism 141
14.6. Maritime Heritage 141
14.7. Commercial Fisheries 142
14.1. Aquaculture 157
14.2. Recreational Fisheries 157

**15. References 159**
15.1. Physical Environment 159
15.2. Benthic and Pelagic Habitats 160

15.3. Shoreline Habitats 165
15.4. Intertidal Habitats 167
15.5. Fish and Sharks 168
15.6. Marine Reptiles 172
15.7. Marine Mammals 175
15.8. Birds 181
15.9. Protected Areas 184
15.10. Key Ecological Features 190
15.11. State Marine Parks 194
15.12. Australian Marine Parks 195
15.13. Conservation Management Plans 196
15.14. Commercial and Recreational Fisheries 198
15.15. Social and Economic Features 199

# Tables

Table 1: EPBC listed fish and shark species in the EMBA ....36
Table 2: Spawning and aggregation times of key commercially caught fish species within the North West Shelf 40
Table 3: Biologically important areas – Fishes and Sharks ....48
Table 4: EPBC listed marine reptile species in the EMBA ....50
Table 5: Summary of habitat types for the life stages of the six marine turtle species in the EMBA (DSEWPaC, 2012b) 52
Table 6: Biologically Important Areas/Habitat Critical and geographic locations - reptiles ....65
Table 7: Marine mammals listed as threatened or migratory under the EPBC Act ....67
Table 8: Summary of information for marine mammals listed as threatened under the EPBC Act ....79
Table 9: Biologically Important Areas – marine mammals ....80
Table 10: Birds listed as threatened under the EPBC Act ....84
Table 11: Summary of information for birds listed as threatened under the EPBC Act that may be in the EMBA 90
Table 12: Summary of migratory birds that may occur within the EMBA ....91
Table 13: Feeding guilds based on prey choice and foraging method (Rogers 1999) adapted from DEC (2003) and Bennelongia (2008) ....92
Table 14: Birds subject to the Wildlife Conservation Plan for Migratory Shorebirds 2015 ....94
Table 15: Birds (migratory) subject to the Wildlife Conservation Plan for Seabirds 2020 ....96
Table 16: Critical habitat/ biologically important areas - birds ....99
Table 17: Summary of protected areas in waters within the EMBA ....100

Table 18: Coastal National Parks – coastal boundary in relation to inter-tidal zone .....105
Table 19: Nature Reserves (NR), Conservation Parks (CP), Regional Parks (RP) and Coastal Reserves (CR) in the EMBA 106
Table 20 Summary of marine network values, pressures, management programs and actions applicable to the EMBA 127
Table 21: Summary of EPBC Act recovery plans applicable to the EMBA .....129
Table 22: Commercial fisheries with permits to operate within the EMBA.....144

# Figures

Figure 1: IMCRA 4.0 Provincial Bioregions within the EMBA .....9
Figure 2: Seasonally averaged winds at 10 m above mean sea level.....13
Figure 3: Surface currents in the NT and WA.....15
Figure 4: Biologically Important Areas – Whale Shark .....44
Figure 5: Biologically Important Areas and Habitat Critical – Loggerhead Turtle.....54
Figure 6: Biologically Important Areas and Habitat Critical – Green Turtle.....56
Figure 7: Biologically Important Areas and Habitat Critical – Hawksbill Turtle .....59
Figure 8: Biologically Important Areas and Habitat Critical – Flatback Turtle .....62
Figure 9: Biologically Important Areas – Pygmy Blue Whale .....71
Figure 10: Biologically Important Areas – Southern Right Whale.....74
Figure 11: Biologically Important Areas – Humpback Whale.....75
Figure 12: Biologically Important Areas – Dugong.....78
Figure 13: Biologically Important Areas – Seabirds .....89
Figure 14: Key ecological features in the EMBA .....108
Figure 15: Protected areas in and adjacent to the EMBA – WA State Marine Parks and Management Areas .....117
Figure 16: Protected areas adjacent to the EMBA – Australian Marine Parks.....120
Figure 17: AMSA ship locations and shipping routes.....138
Figure 18: Defence activities.....140
Figure 19: WA State managed fisheries overlapping the EMBA – Map 1 .....153
Figure 20: WA State managed fisheries overlapping the EMBA – Map 2.....154
Figure 21: WA State managed fisheries overlapping the EMBA – Map 3.....155
Figure 22: Commonwealth managed fisheries overlapping the EMBA .....156

# 1. Introduction

## 1.1. Overview

Santos Energy Limited (Santos) is the titleholder of multiple petroleum titles for exploration, development, production and decommissioning activities located in marine waters off north-western Western Australia and the Northern Territory. This document describes the EMBA outlined in the Bedout Basin Multi Well Exploration and Appraisal Drilling (WA-541-P, WA-435-P and WA-436-P) Environmental Plan (EP) (Document No. 7720-650-EMP-0005) and includes details of the relevant values and sensitivities of that environment as required by the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023* and State Western Australian *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012*, *Petroleum (Submerged Lands) (Environment) Regulations 2012 and Petroleum Pipelines (Environment) Regulations 2012.*

The socio-economic EMBA (the EMBA) for the drilling activities, outlined in Section 3 of the Bedout Basin Multi-Well Exploration and Appraisal Drilling (WA-541-P, WA-435-P and WA-436-P) EP (Document No. 7720-650-EMP-0005), represents the total area potentially affected by the worst-case hydrocarbon spill events associated with the activity. Worst-case hydrocarbon spills, particularly during drilling activities, generally have the largest EMBA of all the environmental impacts and risks managed by Santos. Santos routinely commissions hydrocarbon spill modelling studies to assist in assessing the environmental risk of a hydrocarbon spill. Section 3.1 of the EP describes the EMBA and how it was determined for the proposed activities. It is important to note that the EMBA is used to identify the full range of environmental and socioeconomic receptors, however, it is not considered representative of potential ecological impacts (NOPSEMA, 2019).

The EMBA encompasses the full range of values (including ecosystem, spiritual and monetary provision) and sensitivities (receptors vulnerable to impact) that might be contacted by surface and subsurface hydrocarbons in the unlikely event of any worst-case oil spill from Santos' activities. These receptors include more broadly the physical environments and biological communities present, as well as protected species and areas, socio-economic and cultural features and values.

This document is updated annually and informed by searches of:

- the Protected Matters search tool (PMST) published by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW). PMST searches were undertaken in April 2025 and are provided in Appendix D of the EP;
- published scientific literature and studies; and
- State protected species databases, where applicable.

Descriptions of marine and coastal fauna within the EMBA that may credibly be impacted by the activities are provided, with a focus on protected species that are threatened and migratory.

The EMBA was used to run the database searches mentioned above, and includes the same spatial data used to inform the figures in the EP and sections below, ensuring that the full range of environmental receptors that might be affected by surface and subsurface hydrocarbons at the low exposure level have been considered.

## 1.2. Geographical Extent

The EMBA includes the coastal waters and shoreline habitats of Western Australia (WA), extending approximately from the Abrolhos Islands to the waters north of Broome and westwards into Commonwealth marine waters. This area largely overlaps the Commonwealth North-West Marine Region (NWMR) as well as the South-West Marine Region (SWMR). Based on the Integrated Marine and Coastal Regionalisation of Australia (IMCRA) Version 4.0 spatial framework, there are 10 provincial-scale bioregions that occur within the EMBA. These bioregions are based on the characteristics of fish assemblages, benthic habitats, and oceanographic data (IMCRA v. 4.0). Where relevant, the physical, biological, and social environments within the EMBA are discussed with reference to the IMCRA Provincial Bioregions. The bioregions of most relevance (Figure 1) are:

North-west Marine Region

- Northwest Shelf Transition
- Timor Province
- Northwest Transition
- Northwest Province
- Northwest Shelf Province
- Central Western Transition
- Central Western Shelf Transition
- Central Western Shelf Province.

South-west Marine Region

- Central Western Province
- Southwest Shelf Transition

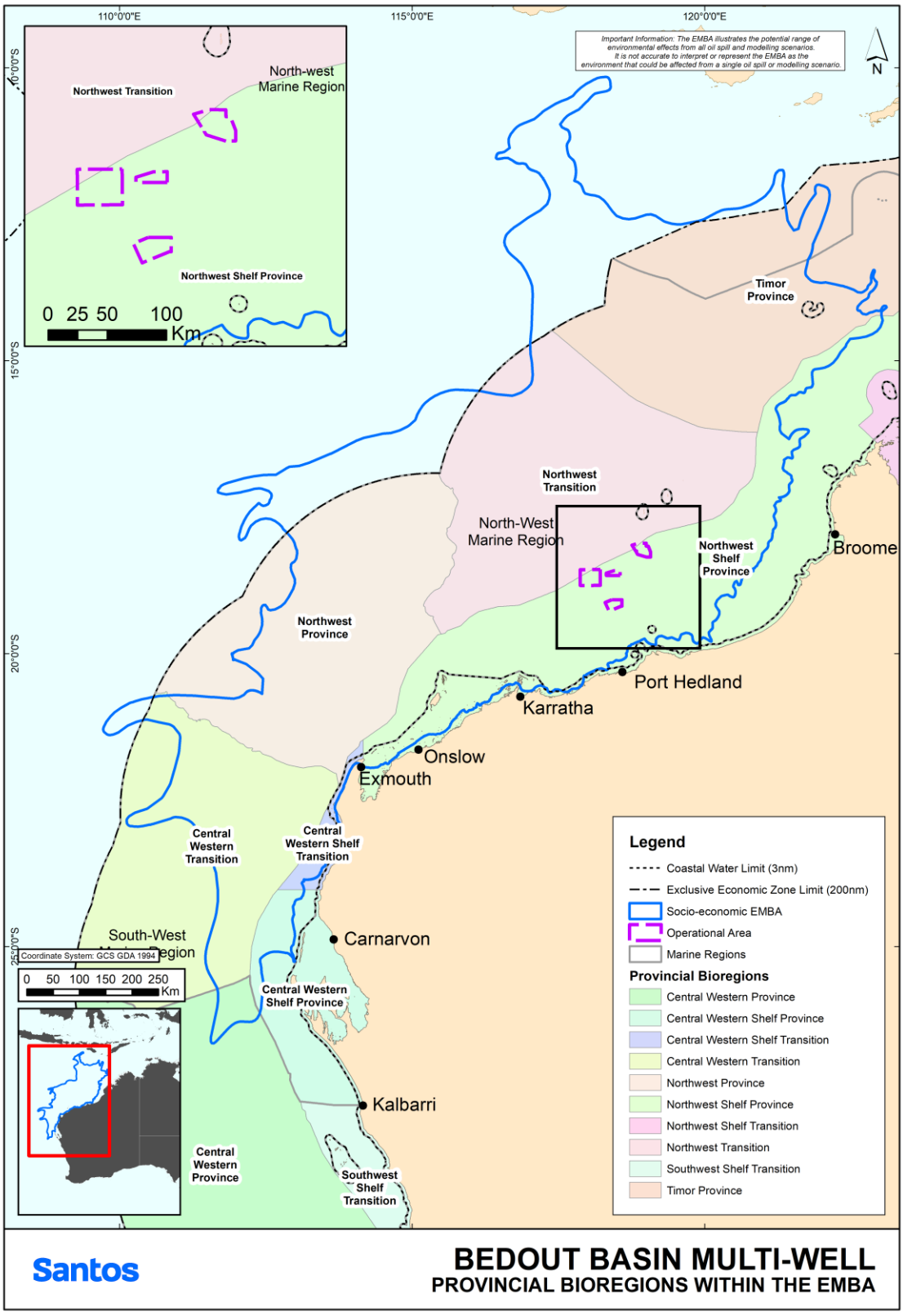



**Figure 1: IMCRA 4.0 Provincial Bioregions within the EMBA**

# 2. Physical Environment

## 2.1. Geomorphology

### 2.1.1. Formation History

Approximately 550–160 million years ago, the northern and western parts of the present-day Australian continent formed part of the northern margin of Gondwana. About 300 million years ago, crustal stretching, rifting and breakup initiated the development of an extensive basin that became the site for deposition of sediments (Baker et al. 2008 in Department of the Environment, Heritage, Water, and the Arts (DEWHA) 2008a). Approximately 135 million years ago the continent broke up resulting in the separation of greater India and Australia. Ocean spreading associated with the continental break-up resulted in the creation of the Argo and Cuvier abyssal plains. Subsidence of the rifted margin resulted in the formation of the Exmouth and Scott plateaux and the Rowley Terrace. The narrow shelf south of North West Cape was formed approximately 130 million years ago as a result of the separation of India and sea floor spreading (Baker et al. 2008 in DEWHA 2008a).

The South-west region has been relatively stable throughout its recent geological past. This has shaped a continental shelf that has high wave exposure and is punctuated with coastal features such as island groups and fringing coastal reefs providing sheltered habitats for marine communities (DEWHA 2008a).

### 2.1.2. Present Day Geological Features

The EMBA consists of five major landform features: continental shelf, continental slope, continental rise, Exmouth plateau and abyssal plain. Most of the area consists of either continental shelf or continental slope (DEWHA 2008a).

Limited surveys have shown that the continental slope in the EMBA comprises diverse geological features such as canyons, plateaux, terraces, ridges, reefs, banks and shoals (DEWHA 2008a) (Figure 2). These features are significant in that over half of the total area of banks and shoals across Australia's entire marine jurisdiction occurs in the Commonwealth waters from the South Australian border to the Northern Territory border, as well as 39 % of terraces and 56 % of deeps, holes and valleys (DEWHA 2008a).

An important characteristic of the EMBA is the significant narrowing of the continental shelf around North West Cape from the broad continental shelf in the north. Shelf width affects oceanography with flow on effects to productivity and ecosystem functioning.

The continental shelf north of Cape Leveque is characterised by a rimmed ramp where the waters over the outer margins of the shelf (approximately 50 to 100 m water depth) are shallower than the middle portions (up to 150 m water depth). The rim at its outer edge is the site of several coral reefs including Ashmore, Cartier, Scott and Seringapatam (DEWHA 2008a).

Several geomorphic formations within the EMBA have been associated with Key Ecological Features (DEWHA 2008a) and these are discussed in Section 10.

### 2.1.3. Southwest Shelf Transition

This bioregion consists of a narrow continental shelf, ranging from approximately 40-80 km wide that is noted for its physical complexity. It includes a series of nearshore ridges and depressions that form inshore lagoons, a smooth inner shelf plain, a series of offshore ridges and a steep, narrow outer shelf. The near-shore ridges are formed by eroded limestone reefs and pinnacles that stand 10-20 m above the sea floor. The edge of the inner shelf plain is marked by a series of broken offshore ridges that extend north to the northern limits of the bioregion, where they emerge to support the tropical carbonate reef growth of the Houtman Abrolhos Islands (DEWHA, 2008b).

### 2.1.4. Central Western Province

This bioregion is characterised by a narrow continental slope that is heavily incised by many submarine canyons as far north as Kalbarri. The Perth Canyon, located at the southern margin of the bioregion, is an order of magnitude larger than any other canyon in the Region. The Perth Canyon, formed by erosive processes associated with the ancient Swan River, cuts into the continental shelf at approximately the 150 m depth contour, north-east of Rottnest Island. Other relatively large canyons, such as the Murchison Canyon, occur in the bioregion but little is known about them as they have not yet been studied (DEWHA, 2008b).

The bioregion contains the most extensive area (52,185 km$^2$) of continental rise on the Australian margin. The continental rise is located on the edge of the Perth Abyssal Plain (103,911 km$^2$). There is a large terrace known as the Carnarvon Terrace on the continental slope, extending north from the Houtman Abrolhos Islands at an average of 780 m water depth (DEWHA 2008b).

### 2.1.5. Central Western Shelf Province

This bioregion is located on the Dirk Hartog Shelf and is generally very flat. It varies in width from less than 20 km in the north to around 125 km in the vicinity of Shark Bay. A small area of reef and tidal sand waves or sandbanks occur at the entrance to Shark Bay and within its vicinity. Other topographic features of the bioregion include a deep hole and associated area of banks and shoals offshore of Kalbarri. The banks and shoals in this bioregion are of note because they occur at latitudes significantly south of banks and shoals elsewhere in the North-west Marine Region (DEWHA, 2008a).

### 2.1.6. Central Western Transition

The Central Western Transition is characterised by large areas of continental slope, with sediments dominated by muds and sands that decrease in grain size with increasing depth. The slope is incised by numerous topographic features such as terraces (i.e. the Carnarvon Terrace), canyons (i.e. Cloates Canyon and Carnarvon Canyon) and rises. A large part of the bioregion consists of the Cuvier Abyssal Plain. The Wallaby Saddle is another important feature of this bioregion, and it is the most extensive area of this type of topographic feature in the North-west Marine Region (DEWHA, 2008a).

### 2.1.7. Central Western Shelf Transition

The Central Western Shelf Transition is located entirely on the continental shelf and is comprised mainly of sandy sediments. The close proximity of the coast to the shelf break is a significant feature of this bioregion and is an important factor in determining its biodiversity (DEWHA, 2008a).

Ningaloo Reef is the most significant geomorphic feature in the bioregion. It extends south of North West Cape along the Cape Range Peninsula, and stretches for over 260 km. It is the only example in the world of an extensive fringing coral reef on the west coast of a continent (DEWHA, 2008a).

### 2.1.8. Northwest Province

The bioregion occurs entirely on the continental slope and is comprised of muddy sediments. It is distinguished by a number of topographic features, such as the Exmouth Plateau, terraces and canyons (including the Swan and Cape Range canyons), as well as deep holes and valleys on the inner slope. The Montebello Trough occurs on the eastern side of the Exmouth Plateau and represents more than 90 per cent of the area of troughs in the North-west Marine Region. Significantly, this bioregion contains the steepest shelf break of the North-west Marine Region, along the Cape Range Peninsula near Ningaloo Reef (DEWHA, 2008a).

### 2.1.9. Northwest Transition

The majority (52 %) of the Northwest Transition bioregion occurs on the continental slope, with smaller areas in the north-west of the bioregion located on the Argo Abyssal Plain and continental rise. The sediments of the slope are dominated by sands, whereas the sediments of the abyssal plain/deep ocean floor are dominated by muds. More than 60 % of the Argo Abyssal Plain occurs within this bioregion and much of the Northwest transition occurs in water over 4,000 m deep (DEWHA, 2008a).

Other topographic features within the bioregion include areas of rise, ridges, canyons and apron/fans. The bioregion also has reefs such as Mermaid, Clerke and Imperieuse reefs, which are collectively known as the Rowley Shoals (DEWHA, 2008a).

### 2.1.10. Northwest Shelf Province

The Northwest Shelf Province is located almost entirely on the continental shelf, except for a small area to the north of Cape Leveque that extends onto the continental slope. This bioregion includes more than 60 % of the continental shelf in the North-west Marine Region (DEWHA, 2008a). The shelf gradually slopes from the coast to the shelf break but displays a number of sea floor features such as banks/shoals and holes/valleys. These are thought to be morphologically distinct from other features of these types found elsewhere in the North-west Marine Region, and have a different sedimentology (DEWHA, 2008a). For example, the Glomar Shoals occur approximately 30–40 km offshore of Dampier in water depths of between 26–70 m and are distinguished by highly

fractured molluscan debris, coralline rubble, and coarse carbonate sand. The province also includes the Leveque Rise, a large plateau, and one of only two shelf plateaux within the North-west Marine Region (DEWHA, 2008a).

### 2.1.11. Northwest Shelf Transition

The Northwest Shelf Transition is predominantly located on the continental shelf with a small portion extending onto the continental slope causing waters in the area to be relatively shallow, only up to 330 m. It also consists of geomorphic features that are unique to the Northwest Shelf Transition and not found elsewhere in the North-west Marine Region (DEWHA, 2008a). An example of this is that 90 % of the Region's carbonate banks are located within the Northwest Shelf Transition (DEWHA, 2008a).

The Bonaparte Depression lies within the Northwest Shelf Transition, which is a 45 000 $km^2$ geomorphic basin that is the only occurrence of its type in the North-west Marine Region (DEWHA, 2008a). The Bonaparte Depression is a relatively flat feature with a higher content of mud and gravel than what is found elsewhere in the Northwest Shelf Transition and it has a number of pinnacles of which form the key ecological feature 'pinnacles of the Bonaparte Basin'.

### 2.1.12. Timor Province

The Timor Province is located on the continental slope. The notable topographical features include the Scott Plateau, the Ashmore Terrace and part of the Rowley Terrace and Argo Abyssal Plain (DEWHA, 2008a). Of these, the Scott Plateau is particularly significant with water depths of up to 3,000 m and being fringed by spurs and valleys (DEWHA, 2008a). The Scott Plateau is also separated from Rowley Terrace by canyons that are up to 50 million years old (DEWHA, 2008a).

The Timor Province encompasses almost half of the reefs in the North-west Marine Region, including Scott Reef, Seringapatam Reef and Ashmore Reef which are all within the EMBA (DEWHA 2008a).

### 2.1.13. Sediments

Terrestrial environments are not a major source of sediment to the EMBA and terrigenous sediments tend to be confined to the inner shelf (generally less than 100 m water depth), particularly in areas adjacent to rivers. Sediments in the area generally become finer with increasing water depth, ranging from sand and gravels on the shelf to mud on the slope and abyssal plain.

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 events such as cyclones. Further offshore, on the mid to outer shelf and on the slope itself, sediment movement is primarily influenced by ocean currents and internal tides. Internal tides describe the tidal movement across a slope of water stratified by marked differences in density. Internal tides cause resuspension and net down-slope deposition of sediments on the North West Shelf (DEWHA 2008a).

Surveys conducted over the North West Shelf indicate that similar sediments occur extensively over this geographic region, but with spatial variation in the grain size and origin of the surface sediments.

The ecology of the southwest is also greatly influenced by the lack of river discharge into the Region. The few significant rivers adjacent to the Region flow intermittently and their overall discharge is low. The low discharge of rivers and the generally low rate of biological productivity also results in low turbidity (suspended sediments), making the waters of the Region relatively clear (McLoughlin & Young 1985). Surface sediments in the area are predominantly composed of skeletal remains of marine fauna, with lenses of weathered sands (McLoughlin & Young 1985).

Shoals and banks are naturally forming, submerged and made of consolidated material such as sand. Normally, the shoal or bank rises close to the water surface having been created when an ocean current deposits sediment. Shoals and banks are found within the EMBA. Glomar shoal is the only shoal within the EMBA that is listed as a Key Ecological Feature and is discussed along with several other geomorphic formations (DEWHA 2008a) in **Section 10**.

## 2.2. Climate

Waters in northern Western Australia predominantly lie in the arid tropics, experiencing high summer temperatures and periodic tropical cyclones in summer. Rainfall in the region is low, although intense rainfall may occur during the passage of summer tropical cyclones and thunderstorms (Condie et al. 2006). Mean air

temperatures range from a minimum of 11°C in winter to a maximum of 36°C in summer (Condie et al. 2006). Due to the arid climate, daytime visibility in the area is generally greater than 5 nautical miles (SSE 1991).

The summer and winter seasons fall into the periods September–March and May–July, respectively. Winters are characterised by clear skies, fine weather, predominantly strong east to southeast winds and infrequent rain (calculated from the National Centres for Environmental Prediction and National Centre for Atmospheric Research (NCEP-NCAR) dataset measured from 1982 to1999; Condie et al. 2006; **Figure 2**).

Summer winds are more variable, with strong south-westerlies dominating. Transitional wind periods, during which either pattern may predominate, can be experienced in April–May and September of each year.

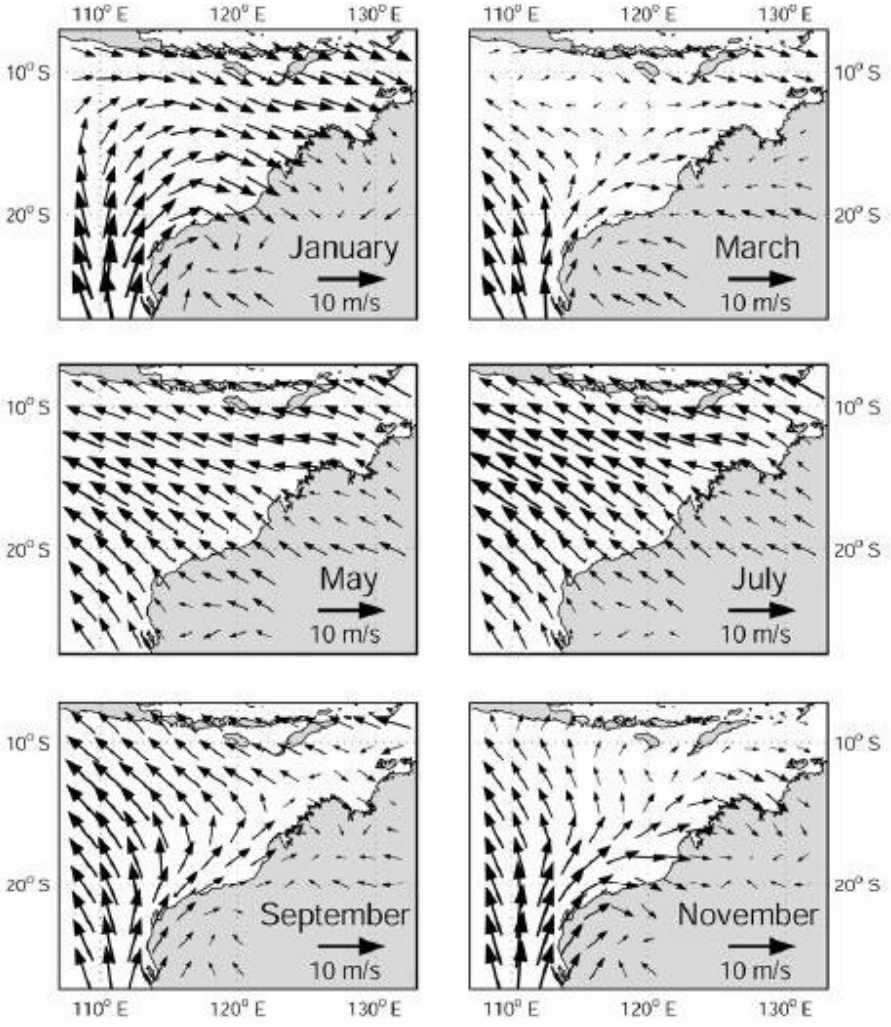



**Figure 2: Seasonally averaged winds at 10 m above mean sea level**

Calculated from NCEP-NCAR dataset measured from 1982 to 1999. Source: Condie et al. (2006)

Tropical cyclones generate the most significant storm conditions in the area (SSE 1993). These clockwise-spiralling storms have generated wind speeds 50–120 knots (SSE 1991). Tropical cyclones develop in the eastern Indian Ocean, and the Timor and Arafura Seas during the summer months. Three to four cyclones per year are typical, with the official cyclone season being November through to April (Bureau of Meteorology (BoM) 2013

The Timor Sea region in the north has a tropical climate. These areas experience a distinct ‘wet’ season with summer monsoonal conditions from October to March and a distinct ‘dry’ season with cooler and drier conditions from April to September. The wet season usually comprises south-westerly winds capable of generating thunderstorm activity, high rainfall and cyclones. The dry season usually comprises dry and warm conditions with little rainfall (Fugro, 2015).

## 2.3. Oceanography

Major drivers of marine ecosystems include ocean currents, tides, waves, temperature and salinity. The dominant offshore sea surface current is the Leeuwin Current (), which carries warm tropical water south along the edge of Western Australia's continental shelf, reaching its peak strength in winter and becoming weaker and more variable in summer (Condie et al. 2006). The current is typically located seaward of the shelf break (200 m isobath) and is a narrow, surface current, extending to a depth of 150 m (BHPB 2005, Woodside 2005) and a width of 50–100 km (DEWHA 2008a). The formation of meanders and eddies are also a feature of the Leeuwin Current and a number of eddies occur south of Shark Bay (DEWHA 2008a). The strength of the Leeuwin Current is influenced by seasonal variability in the pressure gradient (DEWHA 2008a). The Holloway Current is the prevailing seasonal current, travelling south-west along the north West Australian coast in winter and north-east in summer (Brewer et al. 2007). It is a relatively narrow boundary current that flows along the north-west shelf at between 100 m and 200 m depth, flowing towards the north-east in summer and the south-west in winter (Fugro, 2015).

The Indonesian Throughflow is the other important current influencing the upper 200 m of the outer North West Shelf (Woodside 2005). This current brings warm and relatively fresh water to the region from the western Pacific via the Indonesian Archipelago (Figure 3). Modelling undertaken by Woodside and Commonwealth Scientific and Industrial Research Organisation (CSIRO) Marine and Atmospheric Research indicates that significant east–west flows occur across the North West Shelf to the north of the North West Cape, possibly linking water masses in the area (Woodside 2005, Condie et al. 2006).

Currents in the coastal zone and over the inner to mid-shelf are largely driven by tides and winds, whereas offshore, over the continental shelf, slope and rise are influenced by large scale regional circulation (DEWHA 2008a). Large-scale currents of the Timor and Arafura seas in the north are dominated by the Indonesian Throughflow. During summer, monsoon winds are highly influential in driving water movement and water column mixing (O'Hara 2023).

The nearshore Ningaloo Current flows northwards opposite to the Leeuwin Current, along the outside of the Ningaloo Reef and across the inner shelf from September to mid-April (BHPB 2005, Woodside 2005). The nearshore Capes Current, which is to the south of the Ningaloo Current, is a seasonal current that appears strongest between Cape Leeuwin and Cape Naturaliste, in the southwest of Western Australia (Pearce and Pattiaratchi 1999). Strong northwards winds between November and March slow the Leeuwin Current and increase the strength of the Capes Current. Localised upwelling is also known to occur in the area (Pearce and Pattiaratchi 1999).

Tides increase in amplitude from south to north, corresponding with the increasing width of the shelf (Holloway 1983). Tides in the area are generally semi-diurnal (i.e. two high tides and two low tides per day) with a spring/neap cycle. The northern area experiences some of the largest tides in the world. In the Kimberley, the daily tidal range is up to 10 m during spring tides and less than 3 m during some neap tides. Mid-shelf tidal currents are predicted to have average speeds of approximately 0.25 knots during neap tides and up to 0.5 knots during spring tides (NSR 1995, WNI 1995).

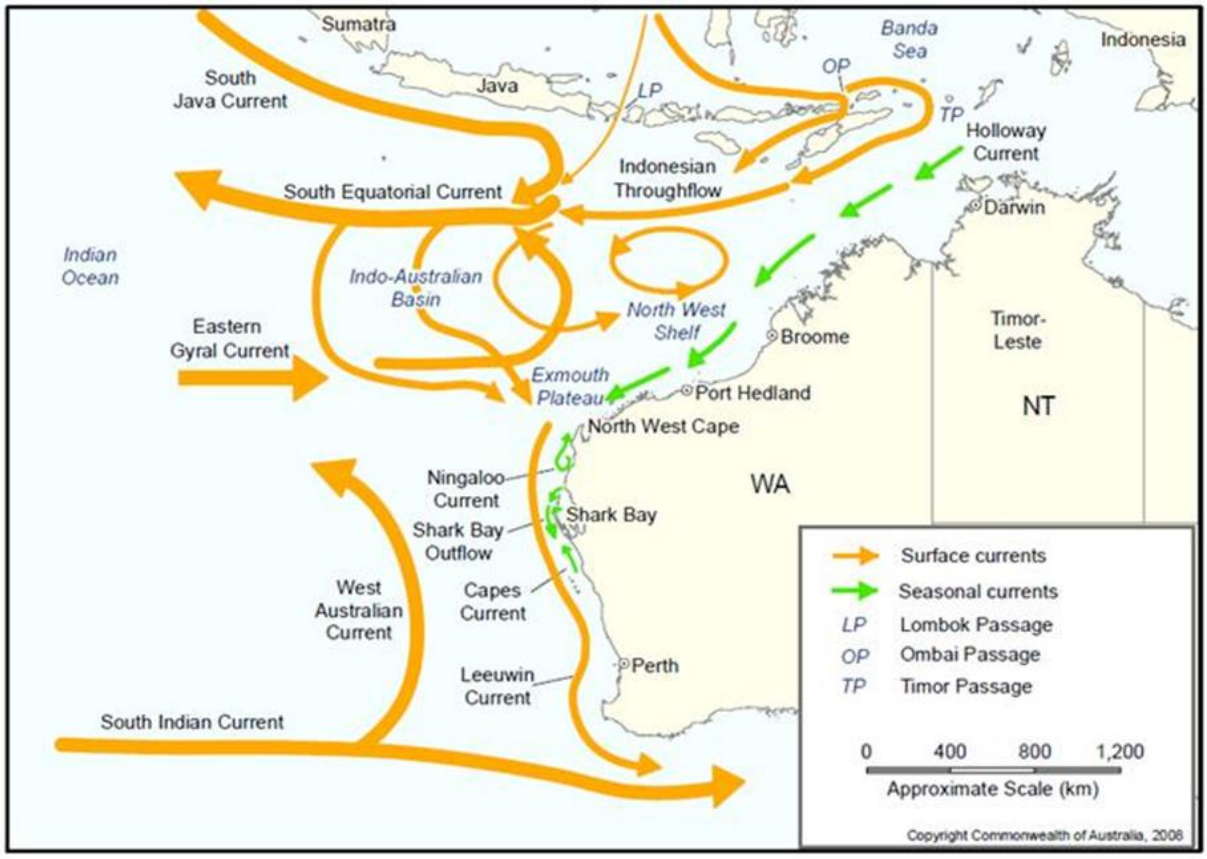
The wave climate in the northwest is composed of locally-generated wind waves (seas) and swells that are propagated from distant areas (WNI 1995). In summer the seas typically approach from the west and southwest, while in winter the seas typically approach from the south and east. Mean sea wave heights are typically less than 1 m and peak heights of less than 2 m are experienced in all months of the year (WNI 1995). Cyclones and tropical storms can greatly increase wave heights by up to 8 m in the outer Timor Sea during the cyclone season (Przeslawski et al. 2011).

Average swell heights are low, around 0.4–0.6 m in all months. The greatest exposure to swells is from the west (SSE 1993). Tropical cyclones have generated significant swell heights of up to 5 m in this area, although the predicted frequency of swells exceeding 2 m is less than 5% (WNI 1996). In the open ocean, sustained winds result in wind-forced currents of approximately 3% of the wind speed (Holloway & Nye 1985).

Waters on the continental shelf are usually thermally-stratified, with a marked change in water density at approximately 20 m (SSE 1993). Surface temperatures vary annually, being warmest in March (32°C) and coolest in August (19°C). Vertical gradients are related to the seasonality of sea surface temperatures and are greatest during the warm-water season (SSE 1991). Near-bottom water temperature on the North West Shelf is approximately 23°C, with no discernible seasonal variation.

Salinity is relatively uniform at 34–35 ppt throughout the water column and across the North West Shelf. Due to the low rainfall there is little freshwater run-off from the adjacent mainland (Blaber et al. 1985).

Pronounced shifts in water column characteristics can occur following the passage of tropical cyclones (McKinnon et al. 2003). Changes in water temperature and salinity characteristics can result from changes in local heating and evaporation following the southward movement of warmer water due to southward-moving cyclones and can have flow-on effects to primary and secondary productivity (McKinnon et al. 2003).




Source: DEWHA (2008b)

**Figure 3: Surface currents in the NT and WA**

# 3. Benthic and Pelagic Habitats

Benthic habitats are defined as those subtidal habitats lying below the lowest astronomical tide (LAT). The benthic habitats within waters in the EMBA lie at depths ranging from LAT down to more than 6,000 m at Argo and Cuvier abyssal plains (DEWHA 2008a, 2008b, 2008c).

Benthic habitats are partially driven by light availability. Primary producers (photosynthetic corals, seagrasses and macroalgae) are limited to the photic zone, whereas benthic invertebrates including filter feeding communities may be found in deeper waters. The depth of the photic zone varies spatially and temporally and is predominantly dependent on the volumes of suspended material in the water column. The photic zone in the offshore Pilbara is approximately 70 m whereas in oceanic waters in the northwest and coastal waters of the southwest the photic zone may extend to 120 m (DEWHA 2008b). The photic zone in the offshore north extends to 100 m (DEWHA 2008c).

The following section broadly categorises benthic habitats as four biological communities: coral, seagrasses, macroalgae and non-coral benthic invertebrates. These communities are discussed in terms of the 18 IMCRA v. 4.0 bioregions.

## 3.1. Coral Reefs

Corals are both primary producers and filter feeders and thus play a role in the provision of food to marine fauna and in nutrient recycling to support ecosystem functioning (Conservation and Land Management (CALM) & Marine Parks and Reserves Authority (MPRA) 2005a).

Corals create settlement substrate and shelter for marine flora and fauna. Studies have shown that declines in the abundance, or even marked changes in species composition of corals, has a marked impact on the biodiversity and productivity of coral reef habitats (Pratchett et al. 2008). As part of the reef building process, Scleractinian corals are also important for protection of coastlines through accumulation and cementation of sediments and dissipation of wave energy (CALM & MPRA 2005a).

The waters in the EMBA contain extensive coral communities. Coral reefs in the area fall into two general groups: the fringing reefs around coastal islands and the mainland shore; and large platform reefs, banks and shelf-edge atolls offshore (Woodside 2011). The distribution of corals is governed by the availability of hard substrate for attachment and light availability.

Coral reefs are dynamic environments that regularly undergo cycles of disturbance and recovery. Depending on how frequent and severe the disturbances are, recovery can take a few years or more than a decade. Disturbances can include bleaching, cyclones and disease outbreaks (Australian Institute of Marine Science (AIMS) 2011).

Corals in the northwest and central provinces have experienced bleaching events and subsequent recovery. Bleaching is the process where symbiotic algae are expelled from the coral tissue, often leading to the death of the colony. Causes of bleaching include high temperatures (Ningaloo; 2011 and Scott Reef; 1998 and 2016) (information available at AIMS.gov.au), anoxic conditions (Bill's Bay; 2008) or smothering (Waples & Hollander 2008, Gilmour et al. 2013). Coral susceptibility to bleaching and their ability to recover is an important consideration in the context of potential anthropogenic impacts.

Three bioregions (Northwest Province, Central Western Province and Central Western Transition) lie in deep waters below the photic zone. Two bioregions (Southwest Transition and Southern Province) occur in waters that are too cold to support tropical coral reefs species. Photosynthetic corals are not present in these locations and hence these bioregions are not discussed further.

### 3.1.1. Southwest Shelf Transition

The coral reefs of the Houtman Abrolhos Islands are the most southern extensive coral community along the west coast. Smaller localised pockets do occur as far south as Rottnest Island and even extend to Cape Naturaliste in the Southwest Shelf Province. The reefs around the Abrolhos Islands comprise 211 known species of corals and all but two of the coral species are tropical (Department of Fisheries (DoF) 2012). The greatest diversity and density of corals is found on the reef slopes, shallow reef perimeters and lagoon patch reefs in the more sheltered northern and eastern sides of each of the three limestone platforms that support the island groups (DoF 2012).

### 3.1.2. Central Western Shelf Province

The Central Western Shelf Province occurs on the continental shelf between Coral Bay and Busselton and is generally flat with depths ranging from 0–100 m. The province includes Shark Bay and Bernier, Dorre and Dirk Hartog Islands.

Studies at Shark Bay recorded 80 species of coral (Marsh 1990). The study determined that salinity and seasonal temperature gradients restrict the distribution of corals to areas that have normal salinity in the western half of the Bay, a few species occur in the metahaline waters but none in the hyper saline areas (Marsh 1990). The eastern shores of Bernier, Dorre and Dirk Hartog Islands provide the most favourable habitats for coral growth due to shelter, and water with relatively small salinity and temperature fluctuations. Some sections of these islands support prolific coral growth (up to 100% cover) both in the sheltered leeward and exposed areas. This bioregion is a transitional zone between the predominantly tropical flora and fauna of the north and temperate flora and fauna further south (CALM & NPNCA 1996).

### 3.1.3. Central Western Shelf Transition

A significant proportion of this bioregion is covered by the Ningaloo Reef. The Ningaloo Reef is unique in that it is the largest fringing reef in Australia and is the only large reef found on the western side of a continent in the southern hemisphere.

A 300 km section of the coast, from Red Bluff to North West Cape and extending to Bundegi in Exmouth Gulf, is included in the Ningaloo Marine Park. Ningaloo Reef supports variable lagoonal, intertidal and subtidal coral communities along its length. Ningaloo Reef is characterised by a high diversity of hard corals with at least 217 species representing 54 genera of hermatypic (reef building) corals recorded to date (Veron & Marsh 1988). The most diverse coral communities are found in the shallow relatively clear water, high energy environment of the fringing barrier reef and low energy lagoonal areas to the west of North West Cape (CALM & MPRA 2005a).

Coral diversity reduces with increasing depth, and corals are uncommon at depths greater than 40 m (Waples & Hollander 2008). At depths between 20 and 30 m hard corals have been found to be more dominant in the northern areas of the Ningaloo Marine Park, whereas in southern areas other sessile invertebrates such as sponges, are more prevalent (Waples & Hollander 2008).

### 3.1.4. Northwest Transition

This bioregion lies mostly over the continental slope and the abyssal plain in deep waters that preclude photosynthetic coral growth (DEWHA 2008a). However, in contrast with the surrounding area, the Rowley Shoals are three distinct reef systems (Mermaid, Clerke and Imperieuse Reefs) approximately 30–40 km apart that rise vertically to the surface from depths of between 500 and 700 m. The marine reef fauna of the Rowley Shoals is considered to be exceptionally rich and diverse, including species typical of the oceanic coral reef communities of the Indo-West Pacific. As many of these species are not found in the inshore tropical waters of northern Australia, such populations are of regional significance (DEWHA 2008a).

A 1993 survey at Mermaid Reef recorded 214 species of scleractinian corals (Done et al. 1994) which is comparable to a more recent survey recording 211 species, including 22 new distribution records (McKinney 2009). The Rowley Shoals system has maintained high coral cover and has not been impacted by mass bleaching, despite neighbouring bleaching events reported at Scott reef during 1998 and 2016 (Gilmour et al*., 2021*). Since 1997, mean coral cover has increased through periods of impact and recovery from cyclones, reaching the highest (71%) on record in 2017 (Gilmour et al. 2019). The survey found that coral assemblages of the Rowley Shoals are broadly comparable to those found on the reefs of the outer Great Barrier Reef and in the Coral Sea. While the coral fauna is similar to Scott Reef, it differs considerably from that of north-western Australia (Veron 1986). Veron (1986) notes that the clear water of the Rowley Shoals allows coral communities to exist over a great range of depths, while the strong wave action on the outer coral slopes and the wide tidal range result in distinct patterns of zonation.

Recent genetic studies have also shown distinct genetic differences between offshore reef systems, the inshore macrotidal Kimberley region and Ningaloo Coast World Heritage Area reefs (Adam et al. 2022, Gilmour et al. 2016, Underwood 2009, Underwood et al. 2020). This is likely a result of their isolation, with negligible supply of larva from other reefs (Adam et al. 2022, Thomas et al. 2017). These studies highlight the importance of local recruitment in offshore reef systems in order to maintain healthy coral populations, which may reduce their capacity to adapt to rapid environmental change.

### 3.1.5. Northwest Shelf Province

This province contains numerous small coastal islands in addition to larger archipelago and offshore island groups. Many of these features are surrounded by shallow waters with small barrier and fringing reefs that support coral communities. Key areas recognised for coral communities in this bioregion are discussed below.

The Dampier Archipelago supports coral reefs in shallow waters near islands and submerged pinnacles. The most significant coral reefs have formed along the seaward slopes of Delambre Island, Hamersley Shoal, Sailfish Reef, Kendrew Island and north-west Enderby Island (CALM & MPRA 2005). Field trips in the Dampier Archipelago between 1972 and 1998 recorded 229 species of corals from 57 genera (Griffith 2004). Surveys of the Dampier Port and inner Mermaid Sound recorded approximately 120 coral species from 43 genera (Blakeway & Radford 2005) with coral reefs dominated by acroporids and pocilloporids. The greatest coral cover (up to 70%) was recorded in the eastern half of the archipelago (Wells et al. 2003).

The Montebello, Lowendal and Barrow islands include 315 islands associated with extensive coral reefs, the most significant of which occur in the sheltered waters on the eastern side of the islands. Examples of these significant reefs include Dugong Reef, Batman Reef and reefs along the Lowendal Shelf (DEC & MPRA 2007a). Dominant corals include acroporids and poritids, with greater than 70% cover recorded for some areas (Chevron 2010). Subtidal coral reef communities around the islands are highly diverse, with at least 150 species of hard corals recorded from fringing and patch coral reef areas (DEC & MPRA 2007a).

Coral distribution near the mainland is restricted by lack of light due to natural turbidity. Corals may exist as sparse coral colonies in some locations, rather than extensive coral communities. Within Exmouth Gulf, coral communities are less common but are present on fringing reefs surrounding islands, as solitary corals distributed across areas of hard substrate, or on larger isolated patch reefs.

An epibenthic dredge survey of nearshore areas north of Broome identified 14 species of hard corals from six families (Keesing et al. 2011). Limited coral surveys conducted at Broome (15 species) and the Lacepede Islands (ten species) (Veron & Marsh 1988) suggest the species diversity in this locality may be low. However, low species diversity observed during the dredge survey may reflect the limited sampling frequency, limited depth range (11–23 m) or inadequate sampling in habitats considered favourable for the proliferation of hard corals (hard substrate). In contrast, other surveys of nearshore locations in the region have recorded much higher levels of species diversity. Veron and Marsh (1988) stated that 102 species of hard corals have been recorded from the Kimberley coast and nearshore reefs and Cairns (1998) recorded 87 species of azooxanthellate hard coral species from north-western Australian waters.

### 3.1.6. Northwest Shelf Transition

Coral communities of the Northwest Shelf Transition have historically not been well studied. However, based on the scale of reef development and the diversity of coral species recorded through limited surveys, it is highly likely that further surveys will demonstrate that the Kimberley contains a coral reef province of global significance (Masini et al. 2009).

Coral reefs in the province include fringing reefs around coastal islands and some mainland shores. Development of coral communities in inshore areas is limited due to persistent high turbidity. Known examples of coral reefs in the bioregion are given below, however further mapping is required.

Benthic habitat surveys at Adele and Long Islands in 2009 and 2010 revealed extensive development of hard and soft coral communities (Richards et al. 2013). Scleractinian coral communities at Adele Island were diverse, supporting 176 species in intertidal and subtidal areas up to 14 m depth. At Long Island approximately 200 species of scleractinian corals were recorded in intertidal and subtidal areas. These surveys also identified two significant and unique habitats; a zone of mixed corallith and rhodolith habitat at Adele Island and an Organ Pipe Coral habitat zone with unusually high benthic cover at Long Island (Richards et al. 2013).

Studies by the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) and the liquified natural gas (LNG) industry indicate that fringing and emergent coral reefs are well developed in the Heyward Island group, around islands in the Bonaparte Archipelago, and off mainland shores of Cape Voltaire and Cape Bougainville. Surveys by INPEX of Maret, Bethier and Montalivet islands, which were largely restricted to the intertidal zone, have recorded 280 species of coral from at least 55 genera, making the Kimberley Bioregion the most coral-diverse area in WA (INPEX 2008).

Montgomery Reef has been identified as a key feature in the area. Montgomery Reef is a huge, submerged rock platform covering approximately 400 $km^2$. Corals occur in the subtidal area around Montgomery Reef, and in the many rock pools on the platform where there is shaded from the sun by algae or rock ledges (DEWHA 2008a). A

survey of benthic habitats at Montgomery Reef was conducted in 2009 by AIMS but a literature search found no published results from this survey (AIMS 2014).

Browse Island is surrounded by a minor fringing coral reef. Assemblages at Browse Island are characteristic of coral platform reefs throughout the Indo-West Pacific region, particularly Cartier Island. Coral diversity was greatest on the reef faces and shallow lagoons, but these areas were of very limited extent (URS 2010a).

Hard corals have been recorded at Echuca Shoals, but the community was low in both species richness and abundance (URS 2010a). The presence of occasional large outcrops suggests that larger coral structures have occurred previously and may still occur elsewhere on the shoal (RPS Environmental 2008).

Scattered areas of coral have been reported in Beagle Gulf and Darwin Harbour (Udyawer et al. 2021, AIMS 2021), Van Diemen Gulf/Cobourg Peninsula (NT Government 2011) and some islands, reefs and other raised features in the inner Joseph Bonaparte Gulf may support isolated corals (Prezlawski et al. 2011). Corals in turbid waters are likely dominated by members of the genus Turbinaria (IMCRATG 1998), while Acropora and Montipora species are reported to occur in clearer waters at the Vernon Islands (Smit et al. 2000; Calnan 2006; IMCRATG 1998).

### 3.1.7. Timor Province

Although water depths in this province are generally deep (200 m to almost 6,000 m) there are several reefs and islands that are regarded as biodiversity hotspots (DEWHA 2008a).

Ashmore Reef, Cartier Island, Hibernia, Scott and Seringapatam Reefs are areas of enhanced local biological productivity, within an area of relatively unproductive waters. Ashmore Reef National Nature Reserve supports one of the greatest number of coral species of any reef off the West Australian coast, with 255 species of reef-building corals in 56 genera (Veron 1993). Taxonomic revisions and additional surveys have resulted in a net increase in species numbers to 275 (Griffith 1997, Ceccarelli et al. 2011). Species are typical of the Indo-pacific region and none are unique or considered endemic. However, 41 species (15% of the total hard coral species at the site) are listed as vulnerable on the International Union for Conservation of Nature (IUCN) Red List (IUCN 2019). In 1998, hard coral covered an area of around 717 ha at Ashmore Reef. The majority of hard corals occur in the deep lagoon (265 ha) and shallow reef top (315 ha) with small areas in the shallow lagoons, and reef edge/slope habitats (Skewes et al. 1999a). The soft, non-reef building corals are less well studied at Ashmore Reef than the hard corals (Hale & Butcher 2013). In 1986, 39 soft coral taxa were recorded within the Ashmore Reef, including the vulnerable blue coral (*Heliopora coerulea*) which was moderately common on the reef flats (Marsh 1993). In 1998, the total cover of soft coral at Ashmore Reef was 323 ha and *Sarcophyton* spp. was the dominant taxa covering around 19 ha in total (Skewes et al. 1999b, Hale & Butcher 2013).

The species composition of all the hard coral reefs in the bioregion is very similar and reflects strong links with Indo-West Pacific fauna, largely as a result of the dispersal of coral spawn via regional currents. The reefs and islands in this bioregion are thought to be important biological stepping-stones between centres of biodiversity in the Indo–Pacific and reef ecosystems further south (DEWHA 2008a).

Seringapatam Reef is a regionally important scleractinian coral reef as it has a high biodiversity, which is comparable to Ningaloo Reef. Results from the Western Australian Museum (WAM) survey in 2006 noted 159 species of scleractinian corals with a hard coral cover of approximately 16% (WAM 2009). The dominant benthic habitats of the reef were observed to include hard and soft corals (Heyward et al. 2013 cited in ConocoPhillips 2018).

Scott Reef consists of two reefs, North Scott Reef and South Scott Reef, which are separated by a deep (400–700 m) channel. North Scott Reef is an annular reef which encloses a lagoon that is connected to the ocean. South Scott Reef is a crescent-shaped reef which forms an arc and partially encloses another lagoon. Light penetration at Scott reef is high due to low turbidity. Light penetration depths to the deeper part of South Reef Lagoon are in excess of 50m with corals able to survive at depths of up to 70 m (Woodside Energy Limited et al. 2010). Studies at Scott reef have identified over 300 scleractinian coral species in the shallow water habitats alone, from almost 60 genera and 14 different families (Gilmour et al. 2013). The Scott reef system has experienced two mass bleaching events in 1998 and 2016, with the latter showing > 90% decreases in cover of branching corals (Porites, Acropora, Millepora, Isopora and Pocillopoiridae) (Gilmour et al., 2021). Regular monitoring following the 1998 mass bleaching event showed increasing cover of branching corals 5 years post bleaching event, with most coral groups recovering approximately 12 years later (Gilmour et al., 2021).

Hibernia Reef consists of an approximately oval-shaped reef, with large areas of the reef becoming exposed at low tide. Hibernia Reef is also characterised by a deep central lagoon and drying sand flats.

There are a number of shoals and banks in the NMR and NWMR. Relatively few studies have been undertaken of these features with the majority of the understanding derived from the Big Bank Shoals study (Heyward et al. 1997), PTT Exploration and Production Public Co Ltd (PTTEP) surveys initiated in response to the Montara incident (Heyward et al. 2010; Heyward et al. 2011) and ConocoPhillips baseline surveys undertaken to support the Barossa Area Development (Heyward et al. 2017). The PTTEP surveys completed at Ashmore, Cartier and Seringapatam Reefs were undertaken during a coral bleaching disturbance likely to be attributed to regional thermal stress indicated by both *in situ* and satellite-based data for the region. The condition of the reefs communities was consistent with previous surveys within the area and did not indicate any disturbance from the Montara incident (Heyward et al. 2010; Heyward et al. 2012).

In general, the submerged features are characterised by abrupt bathymetry, rising steeply from the surrounding outer continental shelf at depths of 100 m–200 m. The shoals and banks tend to flatten at depths of 40-50 m, with horizontal plateau areas of several square kilometres generally present at 20-30 m depths (Heyward et al. 2010). The shoals and banks support a diverse and varied range of benthic communities, including algae, reef-building soft corals, hard corals and filter-feeders (Heyward et al. 1997, Heyward et al. 2012). The plateau areas were dominated by benthic primary producer habitat, with interspersed areas of sand and rubble patches (Heyward et al. 2012).

## 3.2. Seagrasses

Seagrasses are biologically important for four reasons:

- As sources of primary production
- As habitat for juvenile and adult fauna such as invertebrates and fish
- As a food resource
- For their ability to attenuate water movement and trap sediment (Masini et al. 2009).

Twenty-five species of seagrass have been recorded in WA, the highest diversity in the world, and over 30 species of seagrasses have been recorded as occurring within Australian waters (Masini et al. 2009). Waters extending from Busselton to the NT border support predominantly tropical species although temperate species are also found, particularly between Busselton and Exmouth (Walker 1987). One species, *Cymodocea angustata*, is endemic to WA (Department of Parks and Wildlife (DPAW) 2013). Other seagrass meadows of note include those around Tiwi Islands which provide significant habitat to several species. Seagrass habitats also occur within shallower waters near islands and have potential to occur closer to the Indonesian and Timor-Leste coastlines.

The main seagrasses of the northern region of the EMBA are small, ephemeral species that grow on soft sediments and have a seed bank in the surficial sediments that allows them to recover quickly from disturbance (Walker 1989). Small, ephemeral species of seagrass tend to form mixed associations with macroalgae (CALM & MPRA 2005, DEC & MPRA 2007a, BHPBIO 2011) and usually cover less than 5% of the substrate (BHPBIO 2011, van Keulen & Langdon 2011). Areas occupied by these seagrass species vary markedly both seasonally and interannually and it is not clear why some areas of suitable substrate will support seagrass in one year but not the next. It appears that recruitment to what may otherwise be suitable substrate is haphazard, lending weight to the descriptions of these seagrass communities as ephemeral (CALM & MPRA 2005, DEC & MPRA 2007a).

The more temperate regions of the EMBA have large, permanent seagrass meadows that dominate in estuaries and sheltered coastal areas providing year-round habitat and sediment structure support (Kilminster et al., 2018). The persistent meadows of these perennial species often contribute important ecological functions, increasing habitat complexity and supporting biodiverse communities at key life-history stages (Kendrick, et al 2019).

Four bioregions (Northwest Province, Central Western Province, Central Western Transition and Timor Transition) lie entirely in deep waters below the photic zone. Two bioregions (Southwest Transition and Southern Province) occur in waters that are too cold to support seagrasses. Seagrasses are not present hence these bioregions are not discussed further.

### 3.2.1. Southwest Shelf Transition

Species diversity of seagrasses in this bioregion is the highest in the world, with 14 species occurring (DEWHA 2008a). In total, 10 seagrass species have been recorded at the Abrolhos Islands ranging from small, delicate species (e.g. *Halophila* spp.) to larger, more robust types (*Posidonia* spp.) that grow in large meadows (DoF 2012). Small paddle-weeds (*Halophila* spp.) grow in protected lagoon areas or deep waters between the islands,

such as Goss Passage and the larger species may be found growing on reef as well as in sandy areas (DoF 2012). *Thalassodendron pachyrhizum*, which is encountered growing on the exposed reef crest area, has been recorded at several of the island groups. There are also two species of wire-weed (*Amphibolis* spp.), endemic to southern Australia, found at the Abrolhos (DoF 2012). The most abundant seagrass is *Amphibolis antarctica*, while *Amphibolis griffithii* appears to be restricted to bays such as Turtle Bay in the Wallabi Group.

The larger ribbon-weeds (*Posidonia* species) grow in sheltered bays and lagoons where the sand cover is deeper and more stable (e.g. Turtle Bay, the Gap, East Wallabi Island, the lagoon on the west side of West Wallabi Islands and around North Island) (DoF 2012).

Nine species of seagrass are found in the Perth region, including at Rottnest Island where *Amphibolis* thrives in clear waters overlying limestone rock (Amalfi 2006). Seagrasses are a major component of the ecosystem on the Rottnest Shelf, thriving in waters ranging in depth from intertidal to 45m (Amalfi 2006). All of the seagrass species identified with the exception of *Syringodium isoetifolium* and *H. ovalis* are endemic to temperate areas of southern Australia (Amalfi 2006). At Rocky Bay, on the north side of the island where it is protected from big swells and strong south to south-westerly winds, a mix of dense seagrass meadow consisting of *Amphibolis* and *Posidonia* thrive. The meadows around Rottnest Island serve as nurseries for juveniles of many fish species and are home to species such as the cobbler (*Cnidoglanis macrocephalus)* and long-headed flathead (*Leviprora inops*) (Amalfi 2006).

### 3.2.2. Central Western Shelf Province

Shark Bay contains the largest reported seagrass meadows in the world (approximately 4,000 $km^2$), as well as some of the most species-rich seagrass assemblages (Walker et al. 1989). Twelve species of seagrass are found in the Bay with the dominant species being *Amphibolis antarctica*. Seagrass is a fundamental component of biological processes in Shark Bay; it has modified the physical, chemical and biological characteristics of the Bay and provides food, habitat and nursery grounds for many species (CALM & National Parks and Nature Conservation Authority (NPNCA) 1996).

### 3.2.3. Central Western Shelf Transition

Nine species of seagrasses have been found throughout Ningaloo Reef (van Keulen & Langdon 2011). Some delineation of temperate and tropical species exists; however, several species were found throughout the Ningaloo Reef. Halophila ovalis was the most commonly found seagrass at Ningaloo and was generally found growing in sandy patches between coral bomboras. *Amphibolis antarctica* is a large meadow forming species that has been found growing in large clumps in Bateman Bay, north of Coral Bay (van Keulen & Langdon 2011).

### 3.2.4. Northwest Transition

The Rowley Shoals provide the only suitable shallow substrate for seagrasses in this predominantly deep bioregion. Sparse seagrass is found within subtidal coral reef communities of the Rowley Shoals but is not a major habitat type. Two species of seagrass, *Thalassia hemprichii* and *Halophila ovalis*, have been recorded at Mermaid Reef (Huisman et al. 2009). Earlier studies at Mermaid and Imperieuse Reef recorded the above two species and a third species: *Thalassodendron ciliatum* (Walker & Prince 1987).

### 3.2.5. Northwest Shelf Province

In the Northwest Shelf Province, seagrasses are present but sparsely distributed to depths of approximately 30 m (LEC & Astron 1993, URS 2009, CALM 2005a). The abundance and distribution of tropical (and subtropical) seagrass species can vary greatly due to seasonal changes in water quality (turbidity, light penetration) and conditions (wave action, temperature), with biomass tending to peak in summer (Lanyon & March 1995).

Studies between Quondong and Coulomb Points north of Broome identified seagrass communities of *Halophila* spp. patchily distributed across large areas, from the lower intertidal and out to a depth of approximately 20 m (DEC 2008, Fry et al. 2008). Similarly, *Halophila decipiens* was the only seagrass collected from epibenthic dredge studies at five localities near Broome from Gourdon Bay to Packer Island (Keesing et al. 2011).

Roebuck Bay is located south of Broome and includes large areas of intertidal mudflats. Extensive seagrass meadows occur in the northern regions of Roebuck Bay and are dominated by *Halophila ovalis* and *Halodule uninervis*. *Halophila minor* and *Halodule pinifolia* have also been reported at this location (Prince 1986, Walker & Prince 1987, Seagrass-Watch 2019).

In the Dampier Archipelago seagrass occurs in the larger bays and sheltered flats of the area (CALM & MPRA 2005). Six species of seagrass, including three Halophila species, have been recorded on the subtidal soft

sediment habitats (CALM & MPRA 2005). Seagrasses do not form extensive meadows within the proposed reserves, but rather form interspersed seagrass/macroalgal beds. The largest areas of seagrass are found between Keast and Legendre islands, and between West Intercourse Island and Cape Preston (CALM & MPRA 2005).

Surveys near Onslow found that *Halophila* spp. were the most widespread of the seagrasses in that region. Seagrasses were found to be generally sparsely distributed (<10 % cover), occurring in small patches within larger areas of suitable substrate. Small areas of higher (>50 %) seagrass cover occurred in shallow clear water areas but were not common (URS 2009, URS 2010b, Chevron 2010).

Similarly, in the Montebello/Barrow Islands Marine Conservation Reserves, seagrasses appear not to form extensive meadows but are sparsely interspersed between macroalgae. Seven seagrass species have been recorded in the Reserves (DEC & MPRA 2007a) with *Halophila* spp. the most common seagrass species on shallow soft substrates and sand veneers. Distributions of these species extend from the intertidal zone to approximately 15m water depth (DEC & MPRA 2007a). Surveys to the northwest and southeast of Barrow Island from 2002 to 2004 did not identify any significant seagrass meadows but confirmed the presence of sparse coverage of *Halophila* and *Halodule* spp. in shallow areas east of Barrow Island (RPS BBG 2005).

A significant meadow of large seagrasses at Mary Anne Reef east of Onslow was identified almost 30 years ago and its presence today is unconfirmed. The meadow was several hundred hectares (ha) of *Cymodocea angustata* at 30–50 % cover, occurring primarily at a depth of 2–3 m (Walker & Prince 1987).

### 3.2.6. Northwest Shelf Transition

Extensive and diverse intertidal seagrass meadows are known from islands in the southern Kimberley, particularly in the Sunday Island One Arm Point area (Walker 1995, Walker & Prince 1987). Ten species of seagrasses have been recorded at One Arm Point, with the majority of meadows low to moderate in abundance and dominated by *Thalassia hemprichii* with *Halophila ovalis*, *Halodule uninervis* and *Enhalus acoroides* (Seagrass-Watch 2019).

While some seagrasses have been collected from intertidal sites in the central and north Kimberley (Walker et al. 1996, Walker 1997), these areas were not found to be species rich and did not support extensive seagrass meadows like those found in the southern Kimberley.

Subtidal seagrass meadows across the Northwest Shelf Transition are not well mapped. Those mapped in Darwin Harbour and Van Diemen Gulf were found to be patchy (AIMS 2021), although dugongs are known to feed on seagrass communities in coastal waters of the Joseph Bonaparte Gulf (DEWHA 2008a).

### 3.2.7. Timor Province

Seagrass has been reported on the reef flats of offshore reefs of this bioregion (Whiting 1999, Hale & Butcher 2013). Five species of seagrass were reported at Ashmore Reef with *Thalassia hemprichii* being the dominant species (Pike & Leach 1997, Skewes et al. 1999b, Brown & Skewes 2005). The total area of seagrass at Ashmore Reef in 1999 was estimated to be 470 ha (Skewes et al. 1999b). However, much of this was very sparse cover and there were only 220 ha of seagrass with a greater than 10% cover (Brown & Skewes 2005). Seagrass grew in a sparse, patchy distribution across the sand flats, but had a higher coverage on the reef flat area, where it extended to within 100 m of the reef crest. The area of greatest cover and diversity was in the west and south-west areas of the reef on the inner reef flat (Brown & Skewes 2005). These seagrass meadows support a small but significant population of dugongs estimated at around 100 individuals comprising all age classes from calves to adults (Hale & Butcher 2005).

Similarly, Scott Reef supports five species of seagrass (URS 2006), with *Thalassia hemprichii* most abundant (Skewes et al. 1999a, URS 2006). The area of seagrass at Scott Reef is significantly less than that recorded for Ashmore Reef (approximately 100 ha) (Woodside 2011). The highly energetic environment and significant tidal exposure of Scott Reef restricts the area of habitats potentially suitable for seagrass establishment to a small proportion of the total area, resulting in low abundance (Skewes et al. 1999a, URS 2006).

Seringapatam Reef was found to have a seagrass cover of 2 ha out of 5,519 ha (0.04%) composed of *Thalassia hemprichii* and *Halophila ovalis* in approximately equal quantities (Skewes et al. 1999a). This finding contrasts with a more recent survey where only one species of seagrass (*Halophila decipiens*) was recorded at Seringapatam (Huisman et al. 2009).

Skewes et al. (1999a) did not observe any seagrass communities at Hibernia Reef.

## 3.3. Macroalgae

Macroalgae are important contributors to primary production and nutrient cycling in the EMBA, providing food and habitat for vertebrate and invertebrate fauna. Macroalgae are also recognised for their role in spatial subsidies; the movement of nutrients or energy between neighbouring habitats. Spatial subsidies involving macroalgae include the movement of wrack from macroalgal beds to seagrass meadows, bare substrates and shorelines (Orr 2004, Mellbrand et al. 2011).

Macroalgae are primarily associated with hard substrates. They occur in moderate to high cover on exposed hard substrates, but typically have lower cover on hard substrates that are covered with a veneer of sediment (SKM 2009, BHPBIO 2011). Macroalgae exhibit very high seasonal and interannual variation in biomass (Heyward et al. 2006) and distribution, abundance, and biodiversity (Rio Tinto 2009, BHPBIO 2011). The distribution of hard substrates therefore indicates areas that may support macroalgal communities, although abundance and diversity may fluctuate annually.

Macroalgae are susceptible to disturbance from factors such as sedimentation, scouring and turbidity but the marked seasonality in biomass, abundance, diversity, and distribution suggests macroalgae are likely to be resilient to acute, short-term disturbance acting at local scales. Macroalgae may be more susceptible to impacts acting over longer time scales (years) and at certain times of the year, where recruitment at a regional scale could be affected. Indirect impacts affecting the numbers, distribution and community structure of herbivorous fish can also be expected to have impacts (either positive or negative) on macroalgal habitats (Vergès et al. 2011).

Three bioregions (Northwest Province, Central Western Province and Central Western Transition) lie entirely in deep waters below the photic zone. Two bioregions (Southwest Transition and Southern Province) occur in colder waters. Macroalgae are not present hence these bioregions are not discussed.

### 3.3.1. Southwest Shelf Transition

The Houtman Abrolhos Islands have known species of benthic algae with macroalgae communities considered important in supporting a diversity of marine life.

More than 340 species of macroalgae (including 54 species of green algae, 71 species of brown algae, and 222 species of red algae) have been recorded from rock platforms around Rottnest Island (Amalfi 2006).

### 3.3.2. Central Western Shelf Province

Although seagrasses are the most visually dominant organisms found in Shark Bay (Walker et al. 1989) macroalgae are also a significant component within the system, with 161 taxa of benthic macroalgae reported from the location (Kendrick et al. 1990). The seagrass meadows host a large number of epiphytic algal species (Harlin et al. 1985, Kendrick et al. 1990), which numerically dominate the algal flora of the area. Eighty algal species were epiphytic on the seagrass *Amphibolis antarctica*, and of these, over half have been reported both as epiphytes and benthic algae. Benthic macroalgae can be found growing on occasional subtidal rock (limestone–sandstone) platforms and extensive sand flats that occur throughout Shark Bay, and as drift within seagrass meadows (Kendrick et al. 1990).

The benthic algae of Shark Bay are not predominantly temperate as is the case with the seagrasses (Walker et al. 1989) and seagrass epiphytes (Kendrick et al. 1990). The majority of taxa are either of tropical or cosmopolitan distribution. Their local distribution within Shark Bay is correlated with salinity, with benthic algal species richness lower in areas of high salinity (Kendrick et al. 1990).

Limestone platforms occur along the bioregion's coastline and high energy environments are likely to be dominated by large brown algae including *Ecklonia radiata* and *Sargassum* spp. with articulated coralline algae making up the understorey. More diverse algae assemblages may be observed in sheltered locations such as potholes and ledges (DoF 2007).

### 3.3.3. Central Western Shelf Transition

Macroalgal beds along the Ningaloo coastline are generally found on the shallow limestone lagoonal platforms and occupy about 2,200 ha of the Ningaloo Marine Park and Muiron Islands Marine Management Area (CALM & MPRA 2005a). Macroalgal communities within the area have been broadly described (Bancroft & Davidson 2000). The dominant genera are the brown algae *Sargassum*, *Padina*, *Dictyota* and *Hydroclathrus* spp. (McCook et al. 1995).

### 3.3.4. Northwest Transition

Although macroalgae is present at the Rowley Shoals, it is not recognised as a key habitat component in the Mermaid Reef Marine National Nature Reserve Plan of Management (EA 2000) or the Rowley Shoals Marine Park Management Plan (DEC & MPRA 2007b).

There is nothing to suggest that the algal flora of the Rowley Shoals is unique within the Indo-Pacific (Huisman et al. 2009). A study of macroalgae at 16 locations at Mermaid Reef recorded over 100 species (Huisman et al. 2009). The algal flora recorded at the Rowley Shoals represents a small portion of the highly diverse Indo-Pacific flora. The majority of species that were recorded at Mermaid Reef had been previously recorded from mainland north-western Australia or from Indonesia (Huisman et al. 2009).

### 3.3.5. Northwest Shelf Province

Macroalgae are diverse and widespread throughout the Northwest Shelf Province. They are restricted to depths where sufficient light penetrates to the substrate and therefore tend to be most common in shallow subtidal waters down to approximately 20 m depth.

In the nearshore regions of the Pilbara, macroalgae are often a dominant component of the mosaic of benthic organisms found on hard substrates in shallow water. In these shallow waters, regular disturbance to reef habitats from seasonal changes in sedimentation/ erosion patterns and the less frequent impacts of cyclones and storms through sedimentation and scouring may substantially alter the distribution and composition of the benthic communities associated with reefs, including macroalgal habitats (BHPBIO 2011).

Macroalgae dominate shallow (<10 m) submerged limestone reefs and also grow on stable rubble and boulder surfaces in the Dampier Archipelago (CALM & MPRA 2005). Huisman and Borowitzka (2003) reported approximately 200 species of macroalgae from the Dampier Archipelago. Low relief limestone reefs that are dominated by macroalgae, account for 17 % (approximately 35,460 ha) of the marine habitats within the proposed Marine Management Area (CALM 2005a).

Epibenthic dredge surveys along the coastline north of Broome identified 43 species of algae from 22 families (Keesing et al. 2011). The lower species diversity collected by this study is attributed to the method of collection and limited depth range (11–23 m) (Keesing et al. 2011).

Macroalgae occur around the numerous small offshore islands within this bioregion (including Thevenard Island, Airlie Island and Serrurier Island) associated with limestone pavement and protected areas of soft sediments. Dominant species are consistent with those described for the Dampier Archipelago (Woodside 2011).

In the shallow offshore waters of the Pilbara region, macroalgae are the dominant benthic habitat on hard substrates in both the Montebello and Barrow Islands Marine Parks and are the main primary producers (DEC & MPRA 2007a, Chevron 2010). Shallow water habitats outside these marine parks are also likely to support substantial areas of macroalgal habitat wherever conditions are suitable.

Macroalgae occupy approximately 40% of the benthic habitat area in the Montebello/ Lowendal/ Barrow Island region (CALM 2005b). At least 132 macroalgal taxa occur around Barrow Island, with most thought to be widely distributed in the tropical Indo-Pacific region (Chevron 2005).

Macroalgae monitoring around the Lowendal and Montebello Islands since 1996 (The Ecology Lab 1997, IRCE 2002 2003 2004 2006 2007, URS 2009) has found macroalgal cover and biomass to be naturally spatially and temporally variable. *Sargassum* spp. represented 70% of the macroalgal assemblage in 2009, compared to 96% in 2002 (URS 2009). Sargassum spp. cover as a percentage of total macroalgae cover was significantly lower in 2009 than in previous years, primarily due to an increase in filamentous algae at a number of sites (URS 2009).

### 3.3.6. Northwest Shelf Transition

There is a lack of information regarding the marine benthic flora of north-west Western Australia and no comprehensive marine flora list exists for the region (Huisman 2004). However, about 70 algae species were collected during a survey of intertidal reefs on the central Kimberley coast in 1997 (Walker 1997).

Tropical macroalgae species are typically associated with areas of hard substrate and various types of macroalgae occur on rock platforms intermingled with coral and sponge. Abundance and biomass typically exhibit strong seasonal trends (Heyward et al. 2006).

The diversity and abundance of algae in the Kimberley is probably linked to the region’s extreme tidal exposure and highly turbid waters, reducing light penetration and resulting in deposition of fine sediments (Walker 1997).

However, the role of algae appears crucial to the growth of reefs in the highly turbid waters of the Kimberley coast and islands (Brooke 1997). *Sargassum* spp. and coralline algae may be dominant (DPAW 2013).

It is also considered that in offshore parts of the Northwest Shelf Transition, there are high levels of primary production, including macroalgae. This is due to light penetration through relatively clear, shallow waters (DEWHA, 2008a). In particular, carbonate banks and reefs in the Northwest Shelf Transition are considered to support macroalgae, therefore macroalgae would be expected to be present within the Carbonate Bank and Terrace System of the Van Diemen Rise key ecological feature, located within the Northwest Shelf Transition.

### 3.3.7. Timor Province

Macroalgae at Ashmore Reef are estimated to cover over 2,000 ha, mostly on the reef slope and crest areas (Hale & Butcher 2013). The algal community is dominated by turf and coralline algae, with fleshy macroalgae comprising typically less than 10% of total algal cover (Skewes et al. 1999b).

Surveys at Scott and Seringapatam Reefs recorded over 100 species of marine algae (Huisman et al. 2009). The marine algal community was similar between reefs and also similar to the Rowley Shoals. Algae found at these offshore atolls forms a small subset of the Indo-Pacific algal flora, with virtually all of the species identified thus far having been previously collected from north-western Australia or from localities further north. Although further research is necessary, at present there is nothing to suggest that the macroalgae communities of these offshore atolls are unique within the Indo-Pacific (Huisman et al. 2009).

## 3.4. Non-Coral Benthic Invertebrates

The offshore marine environment from Busselton to the Northern Territory is overwhelmingly dominated by soft sediment seabeds; sandy and muddy substrates, occasionally interspersed with hard substrates covered with sand veneers, and rarely, exposed hard substrate. In shallow waters, non-coral benthic invertebrates may form part of the mosaic of benthic organisms found on hard substrates, alongside macrophytes and coral colonies. As light reduces with water depth, non-coral benthic invertebrates are the dominant community, albeit at low densities.

Non coral benthic invertebrates feed by filtering small particles from the seawater, typically by passing the water over a specialised filtering structure. Examples of filter feeders are sponges, soft and whip corals and sea squirts.

### 3.4.1. Southwest Shelf Transition

The inner shelf of the bioregion, extending between 0-50 m deep, includes distinct ridges of limestone reef with extensive beds of macro-algae (principally *Ecklonia* spp.). These inshore lagoons are inhabited by a diverse range of coralline algae, sponges, molluscs and crustaceans. On the outer shelf and shelf break filter feeding sponges and bryozoans dominate the hard bottom. The reefs around the Houtman Abrolhos Islands support 492 known species of molluscs, 110 known species of sponges, 172 known species of echinoderms and 234 known species of benthic algae (DEWHA 2008b). Western rock lobster, the dominant large benthic invertebrate in this bioregion, is an important part of the food web of the inner shelf.

### 3.4.2. Central Western Province

The understanding of marine life in this bioregion is mostly confined to the demersal fish on the continental slope. The exception to this is the Perth Canyon which, although poorly understood, is known to have unique sea floor features with ecological properties of regional significance.

### 3.4.3. Central Western Shelf Province

The Central Western Shelf Province occurs on the continental shelf in water depths from 0 to 100 m. Biological communities of the shelf are likely to include a sparse invertebrate assemblage of sea cucumbers, urchins, crabs and polychaetes on sand substrates. Hard substrates are likely to contain sessile invertebrates such as sponges and gorgonians. The biological communities of this bioregion share many similarities with the adjoining temperate region (DEWHA 2008a).

Stromatolites occur in Shark Bay. Although they are a microbial colony (prokaryote), and not an invertebrate (eukaryote), they are described here as a unique benthic biological community. Stromatolites are rock-like structures built by cyanobacteria. Shark Bay's stromatolites are 2,000 to 3,000 years old and are similar to life forms found on Earth up to 3.5 billion years ago. Until about 500 million years ago, stromatolites were the only macroscopic evidence of life on the planet; hence they provide a unique insight into early life forms and evolution.

The stromatolites are located in the hypersaline environment of Hamelin Pool and are one of the reasons for the area's World Heritage Listing (DPAW 2009).

### 3.4.4. Central Western Transition

The Central Western Transition extends from the shelf break to the continental slope with some parts of the bioregion occurring on the abyssal plain. Water depths range from 80 m to almost 6,000 m. Sediments are dominated by muds and sands that decrease in grain size with increasing depth. The present level of understanding of the marine environment in this bioregion is generally poor. The harder substrate of the slope in waters of 200–2,000 m deep is likely to support populations of epibenthic fauna including bryozoans and sponges. These support larger infauna and benthic animals such as crabs, cephalopods, echinoderms and other filter feeding epibenthic organisms. In the deeper waters of the abyss, the benthic communities are likely to be sparse (DEWHA 2008a).

### 3.4.5. Central Western Shelf Transition

The Central Western Shelf Transition is located entirely on the continental shelf and is comprised mainly of sandy sediments in depths between 0 and 80 m (DEWHA 2008a).

Some sponge species and filter-feeding communities found in deeper waters offshore from the Ningaloo Reef appear to be significantly different to those of the Dampier Archipelago and Abrolhos Islands, indicating that the Commonwealth waters have some areas of potentially high and unique sponge biodiversity (Rees et al. 2004).

### 3.4.6. Northwest Province

The Northwest Province is located entirely on the continental slope in water depths of predominantly between 1,000–3,000 m and is comprised of muddy sediments. Despite the present poor knowledge of the benthic communities on the Exmouth Plateau, information on sediments in the bioregion indicates that benthic communities are likely to include filter feeders and epifauna. Soft-bottom environments are likely to support patchy distributions of mobile epibenthos, such as sea cucumbers, ophiuroids, echinoderms, polychaetes and sea pens.

### 3.4.7. Northwest Transition

The Northwest Transition is located from the shelf break (200 m water depth) over the continental slope to depths of more than 1,000 m at the Argo Abyssal Plain. Benthic habitat mapping surveys and epibenthic sampling conducted by CSIRO at the continental slope (approximately 400 m water depth) showed that all survey sites predominantly comprised soft, muddy sediment, which was often riffled. Gravel, boulders and small outcrops were occasionally recorded. Epifaunal abundance was similar all sites, with epifauna limited to sparsely distributed isolated individuals. Epifauna included isolated scattered sessile crinoids, anemones, glass sponges and seapens. Occasional non-sessile fauna included urchins, prawns and other decapods, holothurians and sea stars. Modelling indicated a 1 km long beam trawl across the continental shelf (approximately 400 m water depth) would be expected to yield sparse (<20 individuals) and low diversity (<10 species) of epibenthic fauna (≥1 cm body size) (Williams et al. 2010). Deeper on the continental slope at approximately 700 m and approximately 1,000 m, habitats were similar to those observed at 400 m (Williams et al. 2010).

Although soft sediment habitat may appear monotonous and featureless, there is likely to be some marked differences in terms of ecological functioning and faunal composition between shelf and deep-sea areas, with the 200 m isobath widely believed to represent a key boundary (Wilson 2013, Brewer et al. 2007, Gage & Tyler 1992). Beyond the 200 m isobath, deep-sea benthic communities rely exclusively on the settling of organic detritus from the overlying water column as a food source. The spatial and temporal distribution of benthic fauna depends on factors such as sediment characteristics, depth and season (Wilson 2013).

Due to contrasting depths, the Rowley Shoals supports a diverse marine invertebrate community including a number of endemic species. Invertebrate species (excluding corals) at the Rowley Shoals include sponges, cnidarians (jellyfish, anemones), worms, bryozoans (sea mosses), crustaceans (crabs, lobsters, etc.), molluscs (cuttlefish, baler shells, giant clams, etc.), echinoderms (starfish, sea urchins) and sea squirts (DEC & MPRA 2007b).

### 3.4.8. Northwest Shelf Province

This bioregion is located primarily on the continental shelf in water depths from 0 to 200 m (DEWHA 2008a). The sandy substrates on the shelf within this bioregion are thought to support low density benthic communities of bryozoans, molluscs and echinoids (DEWHA 2008a). Sponge communities are also sparsely distributed on the

shelf but are found only in areas of hard substrate. The region between Dampier and Port Hedland has been described as a hotspot for sponge biodiversity (Hooper & Ekins 2004).

Epibenthic dredge surveys in nearshore areas around Broome covered 1,350 $m^2$ of seabed in depths between 11 and 23 m. The survey recorded 357 taxa comprising 52 sponges, 30 ascidians, 10 hydroids, 52 cnidarians (not including scleractinian corals), 69 crustaceans, 73 molluscs and 71 echinoderms. The most important species on soft bottom habitats in terms of biomass was the heart urchin *(Breynia desorii)*, whilst sponges were the dominant fauna by biomass on hard bottom habitats. The biomass of other filter feeders, especially ascidians, soft corals, gorgonians was also high, indicating the importance of these groups in characterising hard bottom habitats.

In 2007, CSIRO conducted extensive benthic habitat mapping surveys and epibenthic fauna (living on the surface and ≥1 cm body size) sampling in deep waters (100–1,000 m) spanning thirteen sites between Barrow Island and Ashmore Reef running along the continental shelf and across the continental slope of the North West Shelf (Williams et al. 2010). At the continental shelf margin (approximately 100 m water depth) Williams et al. (2010) reported that similar benthic habitats occurred at each survey site across the breadth of the North West Shelf. Benthic habitats at this depth comprised a mix of riffled muddy sand (sometimes as a veneer over rocky sub-crops) together with gravel to pebble-sized rubble, cobbles, boulders and some rock outcrops. Typical epifauna found at these depths included scattered isolated hydroids, sea fans and soft corals and often small sponges. Other fauna observed at some of the sites included scattered isolated sea whips, crinoids, sea pens, urchins and anemones. Epibenthic fauna along the continental shelf margin were quantified as sparse and low diversity (Williams et al. 2010). Modelling indicated that a trawl sample of 1 km length would generally be expected to yield approximately 80 individuals represented by 15 species (Williams et al. 2010) in 100 m depth waters.

At the shelf edge (approximately 200 m water depth), two sites were surveyed. Both sites were similar to the continental shelf margin, except the northern site mainly comprised coarse material. Epifauna observed at the northern site was similar at 200 m as at 100 m. At the southern site, epifauna included sparse and scattered individual soft corals, anemones, glass sponges and stalked crinoids (Williams et al. 2010). Modelling indicated epibenthic fauna were sparse and had low diversity, numbering approximately 20–40 individuals in a 1 km long trawl sample represented by approximately 5–10 species (Williams et al. 2010).

Baseline studies undertaken in nearshore areas of the Pilbara (SKM 2009, Rio Tinto 2009, BHPBIO 2011) and offshore areas around Barrow Island (Chevron 2010) have shown that filter feeder communities are a dominant component of benthic habitats in depths >10 m where reduced light appears to inhibit extensive development of hard corals and macroalgae. The pavement habitats between Barrow Island and the mainland are covered by a sediment veneer that appears to periodically move, exposing areas of pavement reef. Sessile benthic organisms that require hard substrates for attachment, such as gorgonians, are frequently seen emerging through a shallow veneer of sand. This type of substrate (sediment veneer) with sparse filter feeder communities is common throughout this area (Skm$^2$009, Rio Tinto 2009, BHPBIO 2011).

### 3.4.9. Northwest Shelf Transition

The Northwest Shelf Transition is located on the continental shelf with a small area extending onto the continental slope, with water depths ranging from 0–330 m. Nearshore areas may support significant filter feeding communities, but these have not yet been described (Masini et al. 2009).

Pipeline route surveys north of the Kimberley in water depths from 10–250 m recorded a seabed largely devoid of hard substrate, with only sparse epibenthic fauna noted on the predominantly sandy substrate. Occasional epibenthic fauna (featherstars, gorgonians, bryozoans, sea urchins, hydroids and sponges) were recorded in areas where rocky substrate or outcrops were present (URS 2010a).

In contrast, benthic surveys at Echuca Shoals identified broad areas of hard substrate with substantial epibenthic fauna. The shallow shoal areas were dominated by a flat ‘reef’ platform with crinoids, sea whips, soft corals and low densities of hard corals. With increasing depth (25–80 m) soft corals and sponges became increasingly dominant. At greater depths (80–100 m) the density of epibenthic fauna decreased substantially with sea whips and sea fans became dominant (URS 2010a).

### 3.4.10. Timor Province

The Timor Province is located on the continental slope and abyssal plain and water depths range from 200 m to almost 6,000 m. Benthic studies in this bioregion are scarce, however data from the North West Slope Trawl Fishery suggests that muddy sediments in the Timor Province support significant populations of crustaceans (Brewer et al. 2007). Additionally, research into the demersal fish communities of the continental slope has identified the Timor Province as an important bioregion. This is due to the presence of a number of endemic fish

species, and two distinct demersal community types associated with the upper slope (water depths of 225–500 m) and mid-slope (water depths of 750–1,000 m) (Last et al. 2005). The current understanding of the relationship between demersal fish communities and benthic environments on the continental slope is rudimentary (DEWHA 2008a).

Over 130 species of sponges have been recorded at the Ashmore Reef National Nature Reserve (Russell & Hanley 1993).

Studies of Seringapatam Reef have observed the dominant benthic habitats to include filter feeders, such as sponges, gorgonians, hydroids and seapens (Heyward et al. 2013 cited in ConocoPhillips 2018).

## 3.5. Plankton

Plankton abundance and distribution is patchy, dynamic, and strongly linked to localised and seasonal productivity (Trebilco et al. 2021). 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. As a key indicator for ecosystem health and change, plankton distribution and abundance has been measured for over a century in Australia (Richardson et al. 2015). The compilation of this data has been made publicly available through the Australian Ocean Data Network (Australian Ocean Data Network 2022) and has been used in the Australia State of the Environment 2021 report (Trebilco et al. 2021) to nationally assess marine ecosystem health. According to their findings, primary production has decreased in the north-west and north-east shelf and offshore in the Indian Ocean. Increases have been observed in all waters south of 25S (Trebilco et al. 2021) including in offshore waters in the Great Australian Bight.

Within the EMBA, peak primary productivity varies on a local and regional scale. For example, peak phytoplankton biomass in waters surrounding Broome has been observed in May with a high variability recorded in August, whereas recorded phytoplankton biomass in waters surrounding Geographe Bay has been found to peak during winter and is localised close to the coast (Bloundeau-Patissier et al. 2011). In general, these peaks are linked to mass coral spawning events, peaks in zooplankton and fish larvae abundance and periodic upwelling. Regional upwelling is most common close to the coast and where surface waters diverge. Despite the suppression of major upwelling along the WA coast by the Leeuwin Current, known key upwelling regions include the Ningaloo region (Hanson & McKinnon 2009) and Cape Mentelle (Pattiaratchi 2007). It is also expected that a high abundance of plankton will occur within areas of localised upwelling in the EMBA where the seabed disrupts the current flow.

# 4. Shoreline Habitats

Shoreline habitats are defined as those habitats that are adjacent to the water along the mainland and of islands that occur above the Lowest Astronomical Tide (LAT) and most often in the intertidal zone.

The following section broadly categorises shoreline habitats as the following biological communities; mangroves, intertidal mud/sand banks, beaches, and rocky shores. These communities are discussed in **Sections 4.1- 4.5**, in terms of the 18 IMCRA v. 4.0 bioregions where relevant and where information is available.

## 4.1. Mangroves

Mangroves commonly occur in sheltered coastal areas in tropical and sub-tropical latitudes (Kathiresan and Bingham 2001). Up to eight species of mangroves are found further north in the Central Western Shelf Transition region, but at most locations the dominant mangrove (in terms of area of intertidal zone occupied) is *Avicennia marina*, with the stilt rooted mangrove *Rhizophora stylosa* often occurring as thin zones of dense thickets within the broad zone of *A. marina*. Mangroves are found wherever suitable conditions are present including wave dominated settings of deltas, beach/dune coasts, limestone barrier islands and ria/archipelago shores (Semeniuk 1993). Mangrove plants have evolved to adapt to fluctuating salinity, tidal inundation and fine, anaerobic, hydrogen sulfide rich sediment (Duke et al. 1998).

Mangroves are important primary producers and have a number of ecological and economic values. For example, they play a key role in reducing coastal erosion by stabilising sediment with their complex root systems (Kathiresan and Bingham 2001). They are also recognised for their capacity to help protect coastal areas from the damaging effects of erosion during storms and storm surge. Mangroves are also important in the filtration of run-off from the land which helps maintain water clarity for coral reefs which are often found offshore in tropical locations (National Oceanic and Atmospheric Administration (NOAA) 2010). The intricate matrix of fine roots within the soil also binds sediments together.

Mangroves play an important role in connecting the terrestrial and marine environments (Alongi 2009). Numerous studies (e.g. Nagelkerken et al. 2000, Alongi 2002, Alongi 2009, Kathiresan and Bingham 2001) have shown mangroves to be highly productive and an important breeding and nursery areas for juvenile fish and crustaceans, including commercially important species (Kenyon et al. 2004). They also provide habitat for many juvenile reef fish species.

Mangroves also play an important ecosystem role in nutrient cycling and carbon fixing (NOAA 2010). The trees absorb carbon dioxide from the atmosphere and the organic matter such as fallen leaves forms nutrient rich sediments creating a peat layer that stores organic carbon (Alongi 2009, Ayukai 1998).

The muddy sediments that occur in mangrove forests are home to a variety of epibenthic, infaunal and meiofaunal invertebrates (Kathiresan and Bingham 2001). Crustaceans known to inhabit the mud in mangrove systems include fiddler crabs, mud crabs, shrimps and barnacles. Within the water channels of the estuary, various finfish are found from the smaller fish such as gobies and mudskippers (which are restricted to life in the mangroves) through to larger fish such as barramundi (*Lates calcarifer*) and the mangrove jack (*Lutjanus argentimaculatus).* Mangroves and their associated invertebrate-rich mudflats are also an important habitat for migratory shorebirds from the northern hemisphere, as well as some avifauna that are restricted to mangroves as their sole habitat (Garnet and Crowley 2000).

The two key State regulatory documents relevant to the protection and management of mangroves in WA are:

- EPA (2001) Guidance Statement for Protection of Tropical Arid Zone Mangroves along the Pilbara Coastline. Guidance Statement No. 1; and
- EPA (2016) Technical Guidance – Protection of Benthic Communities and Habitats.

### 4.1.1. Central Western Shelf Province

Shark Bay (in the Central Western Shelf Province) supports the southern-most area of substantial mangrove habitat in Western Australia (Rule et al. 2012). The mangroves of Shark Bay comprise only one species, the white

mangrove *Avicennia marina*, and these trees occur around the coastline in widely dispersed and often isolated stands of varying size.

### 4.1.2. Central Western Shelf Transition

The regional mangroves from Exmouth to Broome (within the Central Western Shelf Transition and southern part of the Northwest Shelf Province) represent Australia's only 'tropical-arid' mangroves. The most significant stand of mangroves in the Central Western Shelf Transition is Mangrove Bay on the western side of the Cape Range Peninsula in the Ningaloo Marine Park. This small area of mangrove (37 ha) represents the largest area of mangrove habitat within the Ningaloo Marine Park and is considered extremely important from a biodiversity conservation perspective (CALM 2005).

### 4.1.3. Northwest Shelf Province

In the Pilbara region, the coast is a complex of deltas, limestone barrier islands and lagoons, with a variable suite of substrates. As a result, mangroves in this region form relatively diverse fringing stands, albeit often stunted in stature but at times quite extensive in area. The mangroves along the Pilbara coastline are the largest single unit of relatively undisturbed tropical arid zone habitats in the world. The area has nine mangrove taxa and a total of 632 $km^2$ mangroves (MangroveWatch 2014). As with most arid zone mangroves, Pilbara mangroves are characterised by open woodlands and shrublands that are of relatively lower productivity than the mangrove communities of the wet tropics because of the extreme water and salinity stresses that affect the intertidal zone in the Pilbara (EPA 2001). Significant stands of mangroves in the Pilbara include:

- Exmouth Gulf: mangrove assemblages within the Bay of Rest on the western shore of the Gulf and the extensive mangrove system on the eastern shore of the Gulf that extends as a series of tidal flats and creek channels from Giralia Bay to Yanrey Flats (Astron 2014). These areas of mangrove are also designated as 'regionally significant' by the EPA (2001). The importance of these mangroves to the Exmouth Prawn Fishery is discussed in Kangas et al. (2006)
- Mainland coast and nearshore islands: mangrove assemblages at Ashburton River Delta, Coolgra Point, Robe River Delta, Yardie Landing, Yammadery Island and the Mangrove Islands are all designated as 'regionally significant' by the WA EPA (2001) and the EPA will give these mangrove formations the highest degree of protection with respect to geographical distribution, biodiversity, productivity and ecological function
- Montebello, Barrow and Lowendal Islands: mangrove assemblages all lay within designated reserves. The mangrove communities of the Montebello Islands are considered globally unique as they occur in lagoons of offshore islands (DEC 2007). Mangrove stands identified on Varanus Island occur on the west coast in discrete patches within the tidal and supratidal zones, at South Mangrove Beach and a small embayment (Astron 2016). Mangrove stands on Varanus Island have been identified as healthy, with similar stands also identified as present on Bridled Island to the north of Varanus Island (Astron 2016).

The mangroves of the Kimberley are particularly diverse and relatively untouched. They occupy a variety of coastal settings including rocky shores, beaches and tidal flats (Cresswell and Semeniuk 2011). They belong to the Indo-Malaysian group of Old World Mangroves centred in the Indian-Pacific area (Cresswell and Semeniuk 2011). Of the eighteen species of mangrove plants known to Australia all are represented in the Kimberley including *Avicennia marina, Aegialitis annulata, Aegiceras corniculatum, Rhizophora stylosa, Ceriops tagal, Osbornia octodonta, Bruguiera exaristata, Camptostemon schultzii, Excoecaria agallocha, Sonneratia alba,* and *Xylocarpus australasicus* (Pendretti and Paling, 2001; Waples, 2007). Of these, ten occur only in the Kimberley (Waples 2007). *Rhizophora stylosa* and *Avicennia marina* are the most common mangrove species along the WA Coast.

Mangroves line much of the coastal area within the western Kimberley (and within the proposed Horizontal Falls Marine Park area). They are known to line the shore in the upper reaches of Talbot Bay and to fringe many of the islands of the Buccaneer Archipelago. There are large stands in the southern section of Dugong Bay. Kingfisher Islands has been noted to exhibit extensive mangroves where 10 species of mangrove have been recorded (Wilson 2013). Mangroves line the shores of the southern coast of Collier Bay and large tracts are found in Walcott Inlet and Secure Bay (Duke et al. 2010). The mangroves on the eastern side of the inlet extend about 30 km inland (Gueho 2007, Pendretti and Paling 2001, Zell 2007). Further along the coast mangroves have been identified lining much of the shores of Doubtful Bay. Mangroves are also known to line the shores of the Sale River and have been identified in George Water. For detailed maps of mangrove distribution refer to Pedretti and Paling (2001).

### 4.1.4. Northwest Shelf Transition

Mangroves are also a prominent feature of the North Kimberley. Fringing mangroves have developed around the edge of Prince Frederick Harbour and to the east of Cape Voltaire extending along the shores of Walmesly Bay and Port Warrender (Zell 2007). This region is humid and *Xylocarpus granatum* is localised here (Cresswell and Semeniuk 2011). The rocky coastline between Cape Pond and Cape Voltaire does not lend itself to mangrove development; instead coastal woodland grows on the shores above high-water mark. Mangroves are interspersed with rocky outcrops and beaches around much of the Admiralty Gulf, Vansittart Bay and Napier Broome Bay (with extensive stands around the Drysdale estuary). Cape Londonderry marks the westerly limit of *Scyphiphora hydrophylacea* (Duke et al. 2010).

Between Cape Londonderry and Cape Dussejour mangrove communities are sparse, and limited to a few small stands in the bays as this part of the coastline is dominated by high relief rocky shores which are exposed to the prevailing easterly winds (Wilson 1994). Extensive mangroves do however line the shores of the islands and rivers in the Cambridge Gulf, where 12 mangrove species have been recorded (Wilson 2013). The mangroves of the Ord River are notable in terms of their structural complexity and diversity. Fourteen species of mangrove have been recorded in the boundaries (Pedretti and Paling 2001). The mangroves of the Cambridge Gulf are important for saltwater crocodiles and mangrove bird communities. A unique type of flycatcher which is an intermediate between *Microcea flavigater* and *Microeca tormenti* has been identified in the mangroves of the Cambridge Gulf (Johnstone 1984). Additionally, the area is important for maintaining stocks of the commercially exploited species of the Red-Legged Banana Prawns (*Penaeus indicus)* (Kenyon et al. 2004).

Further north, mangroves also occur at the Tiwi Islands. Mangrove communities in the Tiwi Islands are predominantly within tidal creeks and are not expected along the shoreline. The Northern Territory mainland coastline, however, has a number of estuaries and rivers that drain into the surrounding hinterland during the wet season, this includes Darwin Harbour that contains approximately 260 $km^2$ of mangroves (INPEX, 2010).

## 4.2. Intertidal Mud/Sand Flats

Intertidal mudflats form when fine sediment carried by rivers and the ocean is deposited in a low energy environment. Tidal mudflats are highly productive components of shelf ecosystems responsible for recycling organic matter and nutrients through microbial activity. This microbial activity helps stabilise organic fluxes by reducing seasonal variation in primary productivity which ensures a more constant food supply (Robertson 1988). Intertidal sand and mudflats support a wide range of benthic infauna and epifauna which graze on microscopic algae and microbenthos, such as bivalves, molluscs, polycheate worms and crustaceans (Zell 2007).

The high abundance of invertebrates found in intertidal sand and mudflats provides an important food source for finfish and shellfish which swim over the area at high tide. Mudflats have also been shown to be significant nursery areas for flatfish. During low tide, these intertidal areas are also important foraging areas for indigenous and migratory shorebirds. Mudflats also play a vital role in protecting shorelines from erosion (Wade and Hickey 2008).

### 4.2.1. Central Western Shelf Province

Shark Bay in the Central Western Shelf Province has a protected intertidal ecological community ‘Subtropical and Temperate Coastal Saltmarsh’, as listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is the northerly limit for this community and there is a transition zone for many saltmarsh species (CALM 1996). The EPBC ‘Listed Advice’ (DSEWPaC 2013a) reports that sediments associated with these communities generally consist of poorly-sorted anoxic sandy silts and clays and may have salinity levels that are much higher than seawater due to evaporation. The drainage characteristics of coastal soils, along with tidal patterns and elevation, can strongly influence the distribution of flora and fauna within the Coastal Saltmarsh ecological community (DSEWPaC 2013a).

### 4.2.2. Northwest Shelf Province

Within Northwest Shelf Province both Roebuck Bay and Eighty Mile Beach are areas with significant intertidal mudflats that are used by birds in spring and summer including species listed as threatened under the *Biodiversity Conservation Act 2016* (BC Act) or EPBC Act or listed on the IUCN Red List of Threatened Species (IUCN 2019). Intertidal mudflats are also an important feature of the Kimberley coast forming in many bays and inlets of the region (Waples 2007). The sediments that dominate these flats are generally of terrigenous origin (Wilson 2013).

The mudflats of the Kimberley coast have been shown to be important for migratory birds of the East Asian-Australasian Flyway, which is estimated to support more than five million migratory shorebirds (Barter 2002, Bennelongia Pty Ltd 2010, Wade and Hickey 2008). The migratory birds visit the mudflats of the Kimberley coast to feed on benthic organisms prior to embarking on a 10,000–15,000 km migration to their breeding grounds in the Artic (Wade and Hickey 2008). Threatened and migratory birds that occur within the EMBA and are listed under the East Asian-Australasian Flyway are indicated in **Table 10, Table 11**, **Table 12 and Table 14**.

### 4.2.3. Northwest Shelf Transition

Extensive mud flats are located in Collier Bay, where the highest tidal range in Australia is found. (Wilson 2013, Zell 2007). A study by (Duke et al. 2010, Masini et al. 2009) also identified fringing mudflats around Walcott Inlet, and Doubtful Bay. The tidal mudflats of Walcott Inlet are up to 5 km wide and support a rich intertidal invertebrate community (Gibson and Wellbelove 2010). These invertebrate communities in turn also support large numbers of waterbirds (Wilson 1994).

Extensive intertidal mudflats occur in Prince Frederick Harbour and are generally backed by mangroves. The mudskipper is known to feed on these mudflats at low tide. Intertidal flats are also a feature of the estuary of the Mitchell River. The mudflats of Port Warrender are known to support 20 shorebird species and tern species and it is likely the other mudflats in the region also support high numbers of birds. The ecological significance of the wetlands of the Mitchell River has been recognised in *A Directory of Important Wetlands in Australia*. Mud and sand flats are also known to surround much of Deep Bay and Napier Broome Bay.

Intertidal sand and mudflats are a common feature of the East Kimberley. Large sand bars are present on the river mouths of the King George River, Berkeley River and Lyne River and intertidal mudflats are extensive along the edges of the Cambridge Gulf. The estuary is wide and very shallow in some sections, and the silt and clay is continually picked up and redeposited by strong tidal currents (Robson et al. 2008). The tidal flats of the Ord River in the Cambridge Gulf have been listed as a wetland of international importance for the conservation of waterbirds under the Ramsar convention. The area supports a variety of fauna including shorebirds and mudskippers. Tidal mudflats are also extensive along the coast between the Cambridge Gulf and the WA-NT Border.

Further north, the Tiwi islands have also been identified as containing tidal flats, whilst the extent of these are not well documented they are thought to be closely related to the mangrove habitats at the Tiwi Islands (ConocoPhillips, 2020).

## 4.3. Intertidal Platforms

Intertidal platforms are areas of hard bedrock and/or limestone with or without a sediment veneer of varying thickness. These platforms can vary from low to high relief and provide a habitat for a diverse range of intertidal organisms (Morton and Britton in Jones 2004, SKM 2009, 2011, Hanley and Morrison 2012) and some species of shore birds (Garnet and Crowley 2000). They are common within each of the coastal bioregions within the EMBA.

### 4.3.1. Southwest Shelf Transition

Intertidal platforms within the Northwest and Southwest bioregions support a mosaic of fauna and flora that typically exhibits strong variability in percent cover, community composition, abundance, and diversity both between and within reefs at varying spatial and temporal scales (SKM 2009, 2011). Reef platforms typically exhibit zonation of fauna and flora from upper to lower levels on the intertidal zone, with increasing diversity, abundance, and biomass lower in the intertidal (Morton and Britton in Jones 2004, SKM 2009, 2010, 2011, Hanley and Morrison 2012).

On the south coast of the Southwest Shelf Province, the coastal geomorphology changes from the predominant limestone reefs to eroded Precambrian rocks. Intertidal platforms are also common along the Southwest Shelf Transition. Shark Bay in the Central Western Shelf Province has a high diversity of intertidal marine habitats because of the diversity of benthic substrate, salinity and the broad geographical features which influence depth, water movement and turbidity (CALM 1996, DSEWPaC 2013b). This includes extensive limestone platforms as well as sand flats, mud flats, salt marsh and mangroves and beaches (CALM 1996).

### 4.3.2. Central Western Shelf Province and Transition

Limestone pavements extend out from the beach into subtidal zones, e.g. along the Ningaloo Coast and North West Cape; and higher relief platforms (>0.5 m off high water mark) are also present at several headlands along the North West Cape.

### 4.3.3. Northwest Shelf Province and Northwest Shelf Transition

Large tidal regimes are likely to be the defining environmental factor influencing the distribution of intertidal flora and fauna in the Northwest Shelf Province and Northwest Shelf Transition. The intertidal area of the Kimberley has an extreme tidal range (hypertidal) which creates unique environmental conditions and habitats not seen else anywhere else in the world. As a remote area many of the habitats are untouched and they are recognised as having significant conservation value (DPaW 2013). DPaW (2013) reports that as a result of the monsoonal influxes of freshwater and land-derived nutrients distinctive tropical marine ecosystems have occurred.

### 4.3.4. International Waters

While no significant areas of intertidal platforms have been identified in international waters, the high energy southern coastlines of the islands of the Lesser Sunda Ecoregion of Indonesia (and also including Timor-Leste) are likely to have areas of exposed pavements consisting of limestone and remnant lava flows (Wilson et al. 2011).

## 4.4. Sandy Beaches

Sandy beaches are those areas within the intertidal zone where unconsolidated sediment has been deposited (and eroded) by wave and tidal action. Sandy beaches can vary from low to high energy zones; the energy experienced influences the beach profile due to varying rates of erosion and accretion. Sandy beaches are found across the EMBA and vary in length, width, and gradient. They are interspersed among areas of hard substrate (e.g. sandstone) that form intertidal platforms and rocky outcrops. There is a wide range of variation in sediment type, composition, and grain size along the EMBA.

Sandy beaches provide habitat to a variety of burrowing invertebrates and subsequently provide foraging grounds for shorebirds (Garnet and Crowley 2000). The number of species and densities of benthic macroinvertebrates that occur in the sand are typically inversely correlated with sediment grain-size and exposure to wave action, and positively correlated with sedimentary organic content and the amount of detached and attached macrophytes (Wildsmith et al. 2005). However, the distributions of these faunas among habitats will also reflect differences in the suite of environmental variables that characterize those habitats (Wildsmith et al. 2005).

Sandy habitats are important for both resident and migratory seabirds and shorebirds (refer Section 2**)** While sand flats and beaches generally support fewer species and numbers of birds than mudflats of similar size; some species such as the beach thick knee (*Esacus giganteus*) a crab eater, are commonly associated with sandy beaches (Garnet and Crowley 2000). Sandy beaches can also provide an important habitat for turtle nesting and reproduction (see marine turtles Section 6.1).

### 4.4.1. Southwest Shelf Transition

Sandy beaches throughout the Abrolhos Islands host breeding populations of the Australian sea lion. The Abrolhos Islands represent the northernmost breeding population of Australian sea lions. The current population at the Abrolhos Islands is estimated to be approximately 90 individuals (DoF 2012).

In addition to this, beaches in the South West province provide a variety of socio-economic values including tourism, commercial and recreational fishing, and support of other recreational activities.

### 4.4.2. Central Western Shelf Province

Sandy beaches are found along the coastline at Shark bay within the marine park which is further described in **Section 12.3.1**.

### 4.4.3. Northwest Shelf Province

Eighty Mile Beach Marine Park is one of the Australia's largest uninterrupted sandy beaches (stretching 220 km ) and is an important feeding grounds for small wading birds that migrate to the area each summer, travelling from countries thousands of kilometres away (DEC 2012a). It is also a listed Ramsar wetland (see Section 9 on Protected Areas).

### 4.4.4. Northwest Shelf Transition

Sand habitat within the Camden Marine Park is mainly associated with shorelines and inlets on both mainland and island shores. Some beach deposits on islands in the Kimberley are composed of skeletal carbonate sand, while they may also consist of sediments from inland areas carried to the sea by rivers and gullies (DPaW 2013). The

sediment coarseness of the sand may vary, and may also be littered with dead shell, rock and/or coral material. Sea cucumbers that ingest sand and filter out microscopic food are often common in this habitat DPaW 2013).

Significant sandy beaches occur on the Tiwi Islands, specifically the west coast of Bathurst Island and the north coast of Melville Island. These beaches are important areas for marine turtles with nesting dominated by flatback and olive ridley turtles (peak nesting in March to May) (Chatto and Baker, 2008).

Generally, in this region, sand habitat is adjacent to either dense mangrove stands or rocky cliffs (DPaW 2013). Beaches can be highly influenced by tide and weather conditions. Those that overlie rock are likely to shift and be ephemeral in nature.

## 4.5. Rocky Shorelines

Rocky shorelines are found across the EMBA and are often indicative of high energy areas (wave action) where sand deposition is limited or restricted (perhaps seasonally or during a cyclone). They are formed from limestone pavement extending out from the beach into subtidal zones, for example along the Ningaloo Coast and North West Cape; higher relief platforms (>0.5 m off high water mark) are also present at a number of headlands along the North West Cape. This habitat is also widespread heading south towards Perth.

Rocky shores can include pebble/ cobble, boulders, and rocky limestone cliffs (often at the landward edge of reef platforms). Rocky outcrops typically consist of hard bedrock, but some of the coastline has characteristic limestone karst cliffs with an undercut notch. Rocky shorelines can vary from habitats where there is bedrock protruding from soft sediments to cliff like structures that form headlands. Rocky shorelines are an important foraging area for seabirds and habitat for invertebrates found in the intertidal splash zone (Morton and Britton cited in Jones 2004). For example, oyster catchers feed along beaches and rocky shorelines (see seabirds in Section 8.2.2).

# 5. Fishes and Sharks

Fish distributions in the EMBA are discussed with respect to the IMCRA Provincial Bioregions which were defined using CSIRO's 1996 regionalisation of demersal fish on the continental shelf to the shelf break, and their 2005 regionalisation of demersal fish on the continental slope to approximately 1,200 m depth (DEH 2006). The EPBC species listed as threatened and migratory found in the EMBA, according to the Protected Matters search (Appendix D of the EP), are shown in Table 1**,** along with their WA conservation listings (as applicable) and discussed in Section 5.2 below.

The following WA conservation codes apply to WA conservation significant fauna:

- Threatened species (listed under the *Biodiversity Conservation Act 2016* (WA) (BC Act)):
  - Critically endangered
  - Endangered
  - Vulnerable
- Specially protected species (listed under BC Act):
  - Migratory
  - Species of special conservation interest (conservation dependant fauna)
  - Other specially protected species
- Priority species (non-statutory state based administrative process):
  - Priority 1, 2 and 3: poorly-known species – possible threatened species that do not meet survey criteria or are otherwise data deficient. Ranked in order of priority. In urgent need of further survey.
  - Priority 4: species that are adequately known, are either: rare but not threatened; meet criteria for near threatened; or delisted as threatened species within last five years for reasons other than taxonomy. Requiring regular monitoring.

A detailed account of commercial and recreational fisheries that operate in the region is provided in the Commercial Fisheries Section 14.7 and detailed in *The State of the Fisheries Report* 2021/2022 (Newman et al., 2023).

**Table 1: EPBC listed fish and shark species in the EMBA**

| Species | Conservation Status | | | Likelihood of occurrence in EMBA | BIA[1] in EMBA |
|---|---|---|---|---|---|
| | EPBC Act 1999 | BC Act 2016[2] | Other WA Conservation Code | | |
| Grey nurse shark (*Carcharias taurus*) | Vulnerable | Vulnerable | - | Congregation or aggregation known to occur within area | None - BIA not found in EMBA |
| White shark, Great white shark (*Carcharodon carcharias*) | Vulnerable & Migratory | Vulnerable | - | Foraging, feeding or related behaviour known to occur within area | None in EMBA |
| Whale shark (*Rhincodon typus*) | Vulnerable & Migratory | Migratory | - | Foraging, feeding or related behaviour known to occur within area | Yes – Refer to **Table 3** |
| Northern river shark, New Guinea river shark (*Glyphis garricki*) | Endangered | - | Priority 1 | Species or species habitat may occur within area | None - No BIA defined |
| Dwarf sawfish, Queensland sawfish *(Pristis clavata*) | Vulnerable & Migratory | Migratory | Priority 1 | Breeding known to occur within area | Yes – Refer to **Table 3** |
| Freshwater sawfish, Largetooth sawfish, River sawfish, Leichhardt's sawfish, Northern sawfish (*Pristis pristis)* | Vulnerable & Migratory | Migratory | Priority 3 | Species or species habitat known to occur within area | Yes – Refer to **Table 3** |
| Narrow sawfish, Knifetooth sawfish (*Anoxypristis cuspidata*) | Migratory | Migratory | - | Species or species habitat known to occur within area | None - No BIA defined |
| Green sawfish, Dindagubba, Narrowsnout sawfish (*Pristis zijsron*) | Vulnerable & Migratory | Vulnerable | - | Breeding known to occur within area | Yes – Refer to **Table 3** |
| Oceanic whitetip shark (*Carcharhinus longimanus*) | Migratory | - | - | Species or species habitat likely to occur within area | None in EMBA |
| Shortfin mako, Mako shark (*Isurus oxyrinchus*) | Migratory | Migratory | - | Species or species habitat likely to occur within area | None in EMBA |
| Longfin mako (*Isurus paucus*) | Migratory | Migratory | - | Species or species habitat likely to occur within area | None - No BIA defined |
| Reef manta ray, Coastal manta ray (*Manta alfredi*) | Migratory | Migratory | - | Species or species habitat known to occur within area | None - No BIA defined |
| Giant manta ray (*Manta birostris*) | Migratory | Migratory | - | Species or species habitat known to occur within area | None - No BIA defined |
| Porbeagle, Mackerel shark *(Lamna nasus*) | Migratory | Migratory | - | Species or species habitat may occur within area | None - No BIA defined |
| Little gulper shark (*Centrophorus uyato*) | Conservation Dependent | - | - | Species or species habitat likely to occur within area | None - No BIA defined |
| Scalloped hammerhead shark (*Sphyrna lewini)* | Conservation Dependent | - | - | Species or species habitat known to occur within area | None - No BIA defined |
| Barrow cave gudgeon *(Milyeringa justitia)* | Endangered | Vulnerable | - | Species or species habitat known to occur within area | None - No BIA defined |
| Cape range cave gudgeon, Blind gudgeon (*Milyeringa veritas*) | Vulnerable | Vulnerable | - | Species or species habitat known to occur within area | None - No BIA defined |
| Blind cave eel (*Ophisternon candidum*) | Vulnerable | Vulnerable | - | Species or species habitat known to occur within area | None - No BIA defined |

[1] Biologically Important Area
[2] The Wildlife Conservation (Specially Protected Fauna) Notice 2018 has been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of threatened, extinct and specially protected species under Part 2 of the BC Act.

## 5.1. Regional Surveys

Within the EMBA a number of important geographical areas for fish exist, including Ningaloo Marine Park, Montebello/Barrow Island Marine Park, Abrolhos Marine Park and the Rowley Shoals.

### 5.1.1. Southwest Shelf Transition

A total of 389 finfish species have been recorded at the Abrolhos Islands (DoF 2012). The Abrolhos Islands and their surrounding coral and limestone reef systems consist of a combination of abundant temperate macroalgae with coral reefs, supporting substantial populations of large species such as baldchin groper and coral trout. Some of the species occurring in the Abrolhos Islands are dependent on larvae carried southward by the Leeuwin Current from areas further north, such as Shark Bay or Ningaloo Reef. Similarly, populations of some of the species occurring at Rottnest Island are dependent on larvae generated from breeding populations at the Abrolhos Islands (DoF 2012).

More than 20 species of sharks have been identified at the Abrolhos Islands (DoF 2012). These sharks include:

- Port Jackson shark (*Heterodontus portusjacksoni*)
- Tiger shark (*Galeocerdo cuvier*)
- Whaler shark (*Carcharhinus brachyurus*)
- Wobbegong (*Orectolobus maculatus*).

Abrolhos waters are considered to be an important food source for sharks, due to the resident fish populations. Various species of rays have been recorded at the Abrolhos Islands. These include the manta ray and the white spotted eagle ray (DoF 2012).

### 5.1.2. Central Western Shelf Province

The Central Western Shelf Province is located near Shark Bay and is the northern limit of a transition region between temperate and tropical marine fauna. Of the 323 fish species recorded from Shark Bay, 83 % are tropical species with 11 % warm temperate and 6 % cool temperate species (CALM 1996).

### 5.1.3. Central Western Shelf Transition

Ningaloo is the largest fringing coral reef in Australia, forming a discontinuous barrier that encloses a lagoon that provides habitat for many fish species. Gaps that regularly intercept the main reef line provide channels for water exchange with deeper, cooler waters (CALM 2005). Ningaloo Reef is a well-known biodiversity hotspot, supported by the direct link between the reef and the ancient reef systems found closer to the equator by the Leeuwin Current (Kemps 2010). Approximately 500 species of fish have been reported to inhabit the reef (Kemps 2010). The Piercam project from inception in 2005 to 2013, identified 165 fish species from 50 families at the Point Murat Navy Pier alone, located within the Ningaloo Marine Park (Whisson & Hoschke 2013).

Seasonal aggregations of whale sharks occur at Ningaloo each year (CALM 2005). There is limited data available on species diversity and distribution of sharks in the Ningaloo area as chondrichthyan biodiversity for the area has not been specifically recorded. Despite this, it is possible that the Ningaloo Reef Marine Park contains the largest and most diverse collection of sharks on the Australian coastline (Stevens et al. 2009). It was estimated in 2009 by Last and Stevens (cited in Stevens et al. 2009), that there are likely to be 118 species of chondrichthyan fishes occurring in the park. Of these species, 59 are shark species predicted to be found at depths of less than 200 m (Stevens et al. 2009).

The lagoon at Ningaloo Reef appears to provide a juvenile habitat and nursery area for shark species such as the grey nurse shark (*C. taurus*), black-tipped reef shark (*Carcharhinus melanopterus*) and other reef sharks (Carcharhinidiae) (Stevens et al. 2009). A study conducted on the distribution and abundance of elasmobranches in the Ningaloo Marine Park, in 2009, tracked the movements of six key shark species. Species such as *Galeocerdo cuvier* (tiger shark) and *Sphyrna mokarran* (great hammerhead) were found to remain for brief time periods in the park, in contrast to other species found to re-visit the Ningaloo area (Stevens et al. 2009). Several species of sharks within Ningaloo have been identified as key indicator species for the health of the system (Stevens et al. 2009).

Barrow Island includes Biggada Reef, an ecologically significant fringing reef, and the Montebello Islands comprise over 100 islands, the majority of which are rocky outcrops; providing fish habitat (DEC 2007a). Within

the Barrow/Montebello region, at least 380 fish species have been recorded (de Lestang & Jankowski 2017). Most species exhibit wide distributions, with local species composition closely resembling that of the Dampier Archipelgao. Coral habitats support the most diverse fish community in this region, comprising, among others, many species of damselfish (Pomacentridae), parrotfish (Scaridae), snappers (Lutijanidae) and groupers (Serranidae) (de Lestang & Jankowski 2017). The region's macroalgal habitats are considered important nursery areas for a diverse range of fish species, such as emperor (Lethrinidae), threadfin bream (Nemipteridae), tuskfish (Labridae) and trevally (Carangidae) (de Lestang & Jankowski 2017).

Ramsar wetlands within the area (e.g. Eighty Mile Beach and Ashmore Reef National Nature Reserve) can also provide important habitat for fish (see Section 9.2).

### 5.1.4. Central Western Transition

The biological communities of the Central Western Transition are thought to be distinctive owing to the proximity of deep oceans areas to the continental slope and shelf, resulting in close interaction between pelagic species of the Cuvier Abyssal Plain and those of the slope and shelf (DEWHA 2008a).

The present level of understanding of the marine environment in this bioregion is generally poor. The diversity of fish and cephalopod species changes with depth, generally decreasing species numbers with increasing depth. The demersal slope fish bioregionalisation identified some endemism in communities in this bioregion (Last et al. 2005), however, it is lower than other areas of the North-west Marine Region (DEWHA 2008a).

Bentho-pelagic fish, such as deep-water snappers (e.g. *Paracaesio* spp, and *Eletis* spp.), hatchetfish (*Argyropelecus* spp.), dragonfish (*Melacosteus* spp.), viperfish (*Chauliodus* spp.) and a number of eels species migrate between the benthic and pelagic systems, forming an important link between these systems (DEWHA 2008a).

Transient fish species through the Central Western Transition bioregion include southern bluefin tuna (migrating to and from spawning grounds), broadbill swordfish (*Xiphius gladius*), bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*) and striped marlin (*Tetrapturus audax*). Pelagic sharks also range across the bioregion following schools of pelagic fish (DEWHA 2008a).

### 5.1.5. Central Western Province

The Perth Canyon appears to be an important ecological feature attracting krill and fish aggregations that in turn attract larger species such as predatory fish and pygmy blue whales (DSEWPaC 2012). Demersal slope fish assemblages in this bioregion are characterised by high species diversity. Scientists have described 480 species of demersal fish that inhabit the slope of this bioregion and 31 of these are considered endemic to the bioregion. Demersal fish on the slope in this bioregion in particular have high species diversity compared with other more intensively sampled oceanic regions of the world. Below 400 m water depth demersal fish communities are characterised by a diverse assemblage where relatively small, benthic species (grenadiers, dogfish and cucumber fish) dominate.

### 5.1.6. Northwest Transition

The Northwest Transition bioregion may support sparse populations of bentho-pelagic fish and cephalopods in low densities. Pelagic fish species likely to be present include grenadiers and hatchetfish (*Argyropelecus* spp.) as well as transient populations of highly mobile pelagic fish. Adult and juvenile southern bluefin tuna are through to migrate through this bioregion on their way to and from spawning grounds in the north-eastern Indian Ocean (DEWHA 2008a).

The slope habitat of this bioregion is associated with important populations of demersal fish species and supports the second richest demersal fish assemblage nationally (Last et al. 2005). Over 508 fish species have been identified on the slope in this area and 64 of these species are endemic. The high diversity and endemism of the demersal fish fauna indicates important interactions between physical processes and trophic structures in this bioregion. For more information on the slope habitat for fish and sharks, refer to Section 10.1.9.

The Rowley Shoals within the Northwest Transition comprise three oceanic reef systems approximately 30–40 km apart, namely Mermaid Reef, Clerke Reef and Imperieuse Reef. The Shoals are thought to provide a source of invertebrate and fish recruits for reefs further south and as such are regionally significant (DEC 2007b).

### 5.1.7. Northwest Shelf Province and Northwest Province

The demersal zone of the North West Shelf (which includes the Northwest Province and Northwest Shelf Province) hosts a diverse assemblage of fish of tropical Indo-west Pacific affinity, with up to 1,400 species known

to occur, with a great proportion of these occurring in shallow coastal waters (Allen et al. 1988). Last et al. (2005) and Fox and Beckley (2005) described the North-west Province as being characterised by a high level of endemism and species diversity. Certain areas of increased biological activity (e.g. Glomar Shoals) attract demersal fish species such as Rankin cod, red emperor, crimson snapper and spangled emperor that are exploited by commercial trawl and trap fisheries (Sainsbury et al. 1992, Fletcher and Santoro 2013).

The shallow waters (<30 m) of the Dampier Archipelago, in the Northwest Shelf Province, support a characteristic and rich fish fauna of 650 species from a variety of habitats including coral and rocky reefs, mangroves, sand and silty bottoms and sponge gardens (Hutchins 2003 & 2004). The majority of these species are found over hard substrate, but significant numbers are also found from soft bottom and mangrove areas. The outer islands of the Archipelago are inhabited predominantly by coral reef fishes whereas inner areas close to the mainland are occupied by mangrove and silty-bottom dwellers. The inter-island passages have a relatively rich soft bottom fauna. EPBC Act protected fish species within the Dampier Archipelago include the dwarf sawfish (*Pristis clavata*), freshwater sawfish (*Pristis pristis*) and narrow sawfish (*Anoxypristis cuspidate*).

The fish fauna of the archipelago is less diverse than the islands of the West Pilbara to the south but are closely related to the fauna at the offshore Montebello Islands (Hutchins 2004). The fish fauna of Barrow/ Lowendal/ Montebello Islands are widespread throughout the Indo-west Pacific region.

Within the southern portion of the Northwest and Northwest Shelf Province, small pelagic fish (e.g. lantern fishes) comprise a third of the total fish biomass (Bulman 2006) and inhabit a range of marine environments, including inshore and continental shelf waters. These small pelagic fish play an important ecological role, not only for this particular area but for the entire NWMR. They feed on pelagic phytoplankton and zooplankton and provide a food source for a wide variety of predators such as marine mammals, sharks, large pelagic fish and seabirds, thus providing a vital link between many of the region's trophic systems (Mackie et al. 2007).

Pelagic fish in the Northwest and Northwest Shelf Province include tuna, mackerel, herring, pilchard and sardine, and game fish such as marlin and sailfish (BBG 1994, Brewer et al. 2007), some of which are targeted by both commercial and recreational fishers. In particular, adult and juvenile southern bluefin tuna are thought to migrate through the North West Shelf on their way to and from spawning grounds in the north-eastern Indian Ocean. However, the timing of these migrations and the use of regional currents to assist their migration is still unclear. The oceanic waters of the North West Shelf are also believed to provide important spawning and nursery grounds for a number of large pelagic fish species. Table 2 provides a summary of the key fish species and likely timing of their spawning in the region (DoF correspondence).

### 5.1.8. Northwest Shelf Transition

Creek systems, mangroves and rivers, and ocean beaches within this region provide habitat for a variety of species including barramundi, tropical emperors, mangrove jack, trevallies, sooty grunter, threadfin and cods (Fletcher and Santoro 2013). The offshore atolls and the continental shelf waters in the Northwest Shelf Transition are also geographically important for fish species. They support species of recreational and commercial interest, including saddle-tail snapper and red emperor, cods, coral and coronation trout, sharks, trevally, tuskfish, tunas, mackerels and billfish (Gaughan et al. 2019).

The Rowley Shoals within the Northwest Shelf Transition comprise three oceanic reef systems approximately 30–40 km apart, namely Mermaid Reef, Clerke Reef and Imperieuse Reef. The Shoals are thought to provide a source of invertebrate and fish recruits for reefs further south and as such are regionally significant (DEC 2007b). See Section 11 on State Marine Parks and Nature Reserves for further details on important geographical areas for fish.

**Table 2: Spawning and aggregation times of key commercially caught fish species within the North West Shelf**

| Species | | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species Common Name** | **Species Latin Name** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** |
| Blacktip shark | *Carcharhinus tilstoni* and *C. limbatus* | ■ | | | | | | | | | | ■ | ■ |
| Goldband snapper | *Pristipomoides multidens* | ■ | ■ | ■ | ■ | ■ | | | | | ■ | ■ | ■ |
| Rankin cod | *Epinephelus multinotatus* | | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Red emperor | *Lutjanus sebae* | ■ | ■ | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ |
| Sandbar shark | *Carcharhinus plumbeus* | | ■ | | ■ | | | | | | | | |
| Spanish mackerel | *Scomberomorus commerson* | | | | | | | | | ■ | ■ | ■ | ■ |
| Pink snapper | *Pagrus auratus* | | | | | ■ | ■ | ■ | | | | | |
| Baldchin groper | *Choerodon rubescens* | ■ | ■ | | | | | | | ■ | ■ | ■ | ■ |
| Crystal (snow) crab | *Chaceon* spp. | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| King George whiting | *Sillaginodes punctatus* | | | | | | ■ | ■ | ■ | ■ | | | |
| Spangled emperor | *Lethrinus nebulosus* | | | | | | | | | ■ | ■ | ■ | ■ |
| Pearl oyster | *Pinctada maxima* | | ■ | ■ | ■ | | | | | ■ | ■ | ■ | ■ |
| Blue-spotted emperor | *Charaxes cithaeron* | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | ■ | ■ |
| Dusky whaler | *Carcharhinus obscurus* | May occur throughout the year | | | | | | | | | | | |
| Whiskery shark | *Furgaleus macki* | | | | | | | | ■ | ■ | ■ | | |
| Gummy shark | *Mustelus antarcticus* | Peak pupping periods unknown | | | | | | | | | | | |
| Fish | Other species | Timing of spawning activity varies between species | | | | | | | | | | | |

### 5.1.9. Timor Province

The diversity of demersal fish assemblages on the continental slope in the Timor Province (as well as the Northwest Transition and the Northwest Province) is high compared to elsewhere along the Australian continental slope (DSEWPaC 2012). Elements of the Timor Province are not well known, due to limited survey data in the northern limits of the region. The province is geographically extensive and includes 418 fish species, 64 of which are endemic to the region (Last et al. 2009). Key indicator species include *Bembrops nelsoni*, *Bythaelurus* sp., *Halicmetus* sp., *Malthopsis* spp, *Neobythites australiensis*, *Nobythites bimaculatus*, *Neobythites macrops*, *Neobythites soelae*, *Parapterygotrigla* sp., *Physiculus roseus* (Last et al. 2005).

Scott and Seringapatam Reefs are regionally important for the diversity of their fauna, including 558 fish species (Department of the Environment (DoE) 2014). Scott Reef has enormous habitat diversity and is considered a hot spot for fish, with five endemic species (DoE 2014). Scott Reef has biogeographic significance due to the presence of species which are at or close to the limits of their geographic ranges, including fish known previously only from Indonesian waters such as cardinalfish, azure damselfish (*Chrysoptera hemicyanea*), comb-tooth blenny (*Escnius schroederi*) and several Gobiids (DoE 2014).

The diversity of fish at Ashmore Reef is also higher than other comparable reefs in the bioregion with over 760 species recorded (Russell et al. 2005, Kospartov et al. 2006. The majority of fish species are shallow water,

benthic taxa that typically inhabit depths down to 100 m and are widely distributed throughout the Indo-West Pacific (Russell et al. 2005). The most species rich groups are gobies (Gobiidae), damselfishes (Pomacentridae), wrasses (Labridae), cardinal fishes (Apogonidae), moray eels (Muraenidae), butterflyfishes (Chaetodontidae), and rockcods and groupers (Serranidae) (Allen 1989, Russell et al. 2005).

## 5.2. Fish Species

No species of fish listed as Threatened under the EPBC Act (Table 1) were identified in the Protected Matters search (Appendix D of the EP).

### 5.2.1. Syngnathids

The EPBC Protected Matters search identified 55 listed marine species of fish which are largely from the family Syngnathidae (Appendix D of the EP). Syngnathids are a group of bony fishes that include seahorses, pipefishes, pipehorses and sea dragons, although taxonomic uncertainty still surrounds a number of these (DEWHA 2012a). Knowledge about the distribution, abundance and ecology of syngnathids is limited, although no species is currently listed as threatened or migratory.

### 5.2.2. Octopuses

A diversity of octopus species are found within the waters surrounding Australia, where they inhabit a range of habitats from the intertidal zone, along the continental shelf, to the water column in the open ocean (Norman and Reid 2000).Several species are targeted by commercial (Section 14.7.1) and recreational fishers.

## 5.3. Sharks, Rays and Sawfishes

The diversity of marine environments in the waters within the NWMR has led to a rich fauna of cartilaginous fish (sharks and rays). Of the approximately 500 shark species found worldwide, 19% (94) are found in the region (DEWHA 2008a). The EPBC Act Protected Matters search (Appendix D of the EP) identified six species of shark and three species of sawfishes listed as threatened within the EMBA (**Table 1**), including:

- Grey nurse shark (*Carcharias taurus*)
- Great white shark (*Carcharodon carcharias*)
- Northern river shark (*Glyphis garricki*)Whale shark (*Rhincodon typus*)
- Dwarf sawfish (*Pristis clavata*)
- Freshwater sawfish (*Pristis pristis*)
- Green sawfish (*Pristis zijsron*).
- Scalloped hammerhead shark (*Sphyrna lewini)*
- Little gulper shark (*Centrophorus uyato*)

Thirteen sharks and rays are specially protected as migratory under the BC Act 2016 in WA including the basking shark (*Cetorhinus maximus)* known to use waters in the Kimberley, Pilbara, Midwest, South Coast, Swan, South West and Warren regions, and the bentfin devilray (*Mobula thurstoni*) in the Pilbara.

Stingrays are found in Australia's coastal waters throughout the EMBA, primarily occupying shallow benthic habitats. Some nearshore and intertidal habitats, particularly in regions of northern Australia that experience greater tidal ranges, have been identified as important nursery areas for many of these species (DBCA 2014).

The Biologically Important Areas (BIAs) within the EMBA for relevant species detailed above are illustrated in **Figure 4**.

### 5.3.1. Grey Nurse Shark

The grey nurse shark (*Carcharias taurus*) is listed as vulnerable under the EPBC Act and the BC Act *and* may be found within the EMBA. In Australia, the grey nurse shark is now restricted to two populations, one on the east coast from southern Queensland to southern NSW and the other is predominantly found around the southwest coast of WA but has been recorded on the North West Shelf (DEWHA 2012b, Pogonoski et al. 2002). It is

believed that the east and west coast populations do not interact, and ongoing research will probably confirm that the populations are genetically different (Last and Stevens 2009).

While it is thought that grey nurse sharks have a high degree of site fidelity, some studies (McCauley 2004) suggest that grey nurse sharks move between different habitats and localities, exhibiting some migratory characteristics. In certain areas grey nurse sharks are vulnerable to localised pressure due to high endemism. The status of the west coast population is poorly understood although they are reported to remain widely distributed along the WA coast and are still regularly encountered, albeit with low and indeterminate frequency (Chidlow et al. 2006).

Grey nurse sharks are often observed hovering motionless just above the seabed, in or near deep sandy-bottomed gutters or rocky caves, and in the vicinity of inshore rocky reefs and islands (Pollard et al. 1996). The species has been recorded at varying depths but is generally found between 15–40 m (Otway & Parker 2000). Grey nurse sharks have also been recorded in the surf zone, around coral reefs, and to depths of around 200 m on the continental shelf (Pollard et al. 1996). Grey nurse sharks feed primarily on a variety of teleost and elasmobranch fishes and some cephalopods (Gelsleichter et al. 1999, Smale 2005).

No grey nurse shark BIAs were identified in the EMBA.

### 5.3.2. Great White Shark

The great white shark (*Carcharodon carcharias*) is listed as vulnerable and migratory under the EPBC Act and is listed as vulnerable under the BC Act. In Australia, great white sharks have been recorded from central Queensland around the south coast to northwest WA but may occur further north on both coasts (Last and Stevens 2009). There are no known aggregation sites for white sharks in the North-west marine region, but the species has been recorded in North West Shelf waters during humpback migrations (DEWHA 2012b). They are widely but not evenly distributed in Australian waters and are considered uncommon to rare compared to most other large sharks (CITES 2004).

Study into great white shark populations is difficult (Cailliet 1996) given the uncertainty about their movements, emigration, immigration and difficulty in estimating the rates of natural or fishing mortality.

Great white sharks can be found from close inshore around rocky reefs, surf beaches and shallow coastal bays to outer continental shelf and slope areas (Pogonoski et al. 2002). They also make open ocean excursions and can cross ocean basins (for instance from South Africa to the western coast of Australia and from the eastern coast of Australia to New Zealand). Great white sharks are often found in regions with high prey density, such as pinniped colonies (DEWHA 2009).

No great white shark BIAs were identified in the EMBA.

### 5.3.3. Northern River Shark

The northern river shark (*Glyphis garricki*) is listed as endangered under the EPBC Act and is one of the rarest species of shark in the world. Adults only recorded in marine habitats, whereas neonates, juveniles and subadults recorded in freshwater, estuarine and marine environments. It is also listed as a Priority 1 conservation species in WA and as Endangered under the NT TPWC Act.

The associated recovery plan (Sawfish and River Sharks Multispecies Recovery Plan, Commonwealth of Australia 2015) identifies adults and juveniles are being known in WA marine waters north of Derby. Pupping and juvenile sharks are identified as known to occur in Cambridge Gulf and pupping is also identified as likely to occur in King Sound. Under the associated recovery plan all areas where aggregations of individuals have been recorded displaying biologically important behaviours such as reproduction, foraging, resting or migrating are considered critical to the survival of the species unless population data suggests otherwise.

No northern river shark BIAs were identified in the EMBA.

### 5.3.4. Whale Shark

The whale shark (*Rhincodon typus*) is listed as vulnerable and migratory under the EPBC Act and is also listed as a specially protected species under the BC Act as a species of special conservation interest (conservation dependent fauna). The species is also classified as vulnerable on the World Conservation Union's Red List of Threatened Species (Norman 2005) and are protected under the WA *Conservation and Land Management Act 1984,* NT TPWC Actand WA *Fish Resources Management Act 1994*.

The whale shark is the largest of all fish (>18 m; Borrell et al. 2011; Chen et al. 1997, Compagno 2001) and is a migratory species with worldwide geographical ranges between 30º N and 35º S (Last and Stevens 2009). Whale sharks are mostly epipelagic, whereby they spend a large amount of time in the top 200 m of the ocean (Tyminski et al. 2015), with a significant portion being spent at surface (<20 m) (Rowat & Brooks, 2012). This leads to an increased potential risk of vessel collision, which has been demonstrated from tracking data of 348 individuals (across all areas of distribution) showing a 92% horizontal and nearly 50% vertical space overlap with persistent large vessel (>300 gross tons) traffic (Womersley et al. 2022). There is a general lack of knowledge on many aspects of whale shark biology, however, the species is known to have a slow rate to sexual maturity, with field-based studies from the Maldives estimating male sexual maturity to be approximately 25 years (Perry et al. 2018), with females potentially maturing even later (Pierce et al. 2021). This 'slow' life-history strategy places whale sharks at increased vulnerability to anthropogenic impacts (Pierce et al. 2021).

The species is oceanic but often forms aggregations in coastal waters at sites throughout the tropics. Typically, these aggregations are seasonal and often coincide with specific productivity events that are a focus of feeding for the animals. For example, whale sharks aggregate to feed on dense swarms of copepods in Baja California (Clark and Nelson 1997), fish spawn off Belize (Heyman et al. 2001) and red crab larvae at Christmas Island (Meekan et al. 2009). However, recent studies analysing fatty acids within whale shark tissue, suggest the species may also feed on benthic food sources, such as floating macroalgae (Meekan et al*.,* 2022; Courturier et al*.,* 2013*; Marcus et al.*, 2016).

One of the best-known aggregation sites for whale sharks occurs along the central and NW coast of Western Australia from March to July and is focused on Ningaloo Reef, within the Exmouth region. The small size and general absence of female whale sharks from Ningaloo Reef suggests that the region may be important for feeding rather than breeding (Norman and Stevens 2007). The timing of this aggregation coincides with a pulse in seasonal productivity that results in large abundances of tropical krill on which these filter feeding sharks feed (Meekan et al. 2006, Jarman and Wilson 2004). At Ningaloo Reef, whale sharks are often found swimming close to the reef front, within a few kilometres of the shore and in water of less than 50 m deep. A tourist industry based on snorkelling with the sharks in this area has developed over the last 15 years and is now estimated to be worth over $4 million annually to the local economy of the Ningaloo region.

Estimates of the size of the population participating in the Ningaloo aggregation are between 300 and 500 individuals (Meekan et al. 2006), but research indicates that the Ningaloo population of whale sharks is declining (Bradshaw et al. 2007).

Whale sharks are known to be highly migratory with migrations of 13,000 km being recorded (Eckert and Stewart 2001). Research on the migration patterns of whale sharks in the western Indian Ocean, and isolated and infrequent observations of individuals, indicate that a small number of the Western Australian population migrate through the North West Shelf. Wilson et al. (2006) tagged 19 whale sharks in 2003 and 2004, with long term movements patterns successfully recorded from six individuals. All travelled north-east into the Indian Ocean after departing Ningaloo Reef, with one tracked to Ashmore Reef and another to Scott Reef. Whale sharks are occasionally observed from Santos'' offshore oil and gas facilities on the North West Shelf (Harriet Alpha and Stag platforms). In general, migration along the northern WA coastline broadly follows the 200 m isobath and typically occurs between July and November (DoE 2015). Whale sharks are well known to occur in the Christmas Island territory. There is evidence that the Christmas Island territory is on the migration route for many individuals, but they are rarely sighted within the Cocos (Keeling) Islands territory.

A common method for monitoring individual whale sharks is the use of variations in spot patterns, which has recently been tested to be 100% successful based on 154 photographic and genetic markers (Meenakshisundaram, 2021).

A biologically important area for whale sharks is located in northern WA, offshore of the Pilbara and Kimberley coastline, and broadly follows the 200 m isobath. The relevant whale shark BIAs in the EMBA are detailed in Table 3 and is shown in Figure 4.

DBCA has a wildlife management program to manage whale shark interactions in reserves - Whale shark management with particular reference to Ningaloo Marine Park (Wildlife Management Program no. 57).

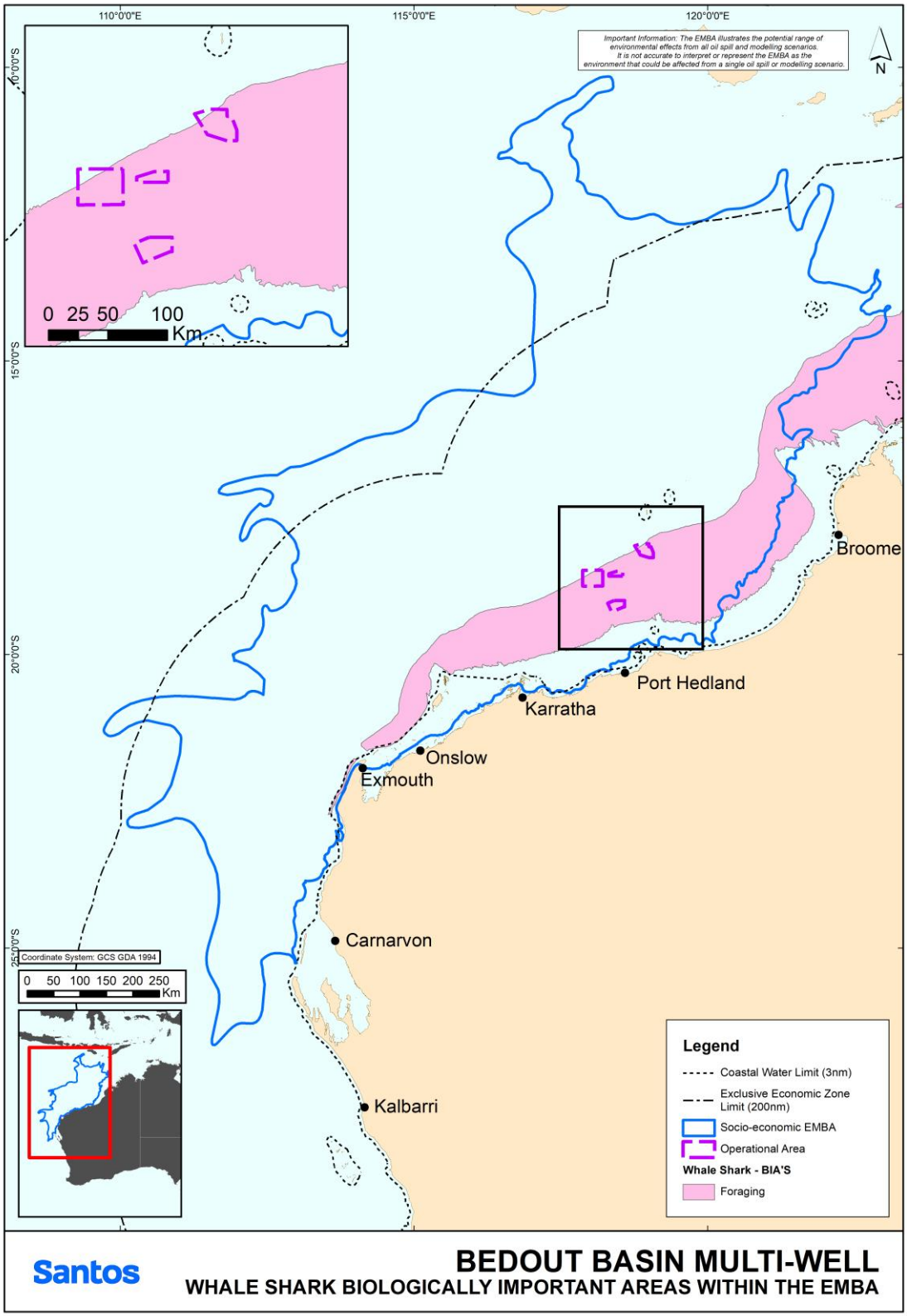



**Figure 4: Biologically Important Areas – Whale Shark**

### 5.3.5. Dwarf Sawfish

The dwarf sawfish (*Pristis clavata*) is listed as vulnerable under the EPBC Act and thought to be restricted to Australia (DoE 2014b). It is also listed as a Priority 1 conservation species in WA and as Vulnerable in the NT. The Australian distribution of the dwarf sawfish is considered to extend across northern Australia and along the Kimberley and Pilbara coasts (Last and Stevens 2009, Stevens et al. 2005). However, the majority of records of dwarf sawfish in WA and the NT have come from shallow estuarine waters of the Kimberley region which are believed to be nursery (pupping) areas, with immature juveniles remaining in these areas up until three years of age (Thorburn et al. 2004). Adults are known to seasonally migrate back into inshore waters (Peverell 2007); although it is unclear how far offshore the adults travel as captures in offshore surveys are very uncommon. The species' range is restricted to brackish and salt water (Thorburn et al. 2007).

The recovery plan identifies pupping as known to occur in the King Sound, the Cambridge Gulf and 80 Mile Beach, with pupping likely to occur identified at a number of locations along the Pilbara and Kimberly Plan (Commonwealth of Australia, 2015). Under the associated recovery plan all areas where aggregations of individuals have been recorded displaying biologically important behaviours such as reproduction, foraging, resting or migrating are considered critical to the survival of the species unless population data suggests otherwise.

The relevant sawfish BIAs in the EMBA are detailed in Table 3.

### 5.3.6. Freshwater and Green Sawfish

The freshwater sawfish (*Pristis pristis) (*also previously listed as the Largetooth sawfish*)* and green sawfish (*Pristis zijsron)* are listed as vulnerable under the EPBC Act. The freshwater sawfish is listed as a Priority 3 conservation species in WA, while the green sawfish is listed as Vulnerable under the BC Act and both species are listed as Vulnerable in the NT under the TPWC Act.

The freshwater species are wider-ranging than the dwarf sawfish and are also found in the Indo-west Pacific (DoE 2014c, DoE 2014d). Important areas for sawfishes include King Sound, and the Fitzroy, Durack, Robinson and Ord rivers for the freshwater sawfish; and Cape Keraudren for the green sawfish (Stevens et al. 2008, Thorburn et al. 2007, 2008).

Sawfishes generally inhabit inshore coastal, estuarine and riverine environments. The freshwater sawfish has been recorded in north-west Australia from rivers (including isolated water holes), estuaries and marine environments (Stevens et al. 2005). Newborns and juveniles primarily occur in the freshwater reaches of rivers and in estuaries, while most adult freshwater sawfish have been recorded in marine and estuarine environments (Peverell 2005, Thorburn et al. 2007). It is believed that mature freshwater sawfish enter less saline waters during the wet season to give birth (Peverell 2005) and freshwater river reaches play an important role as nursery areas (DoE 2014c).

The green sawfish has predominantly been recorded in inshore coastal areas, including estuaries and river mouths with a soft substrate, although there have been records of sawfish offshore in depths up to 70 m (Stevens et al. 2005). This species does not occupy freshwater habitats (DoE 2014d).

Short-term tracking has shown that green sawfish appear to have limited movements that are tidally influenced, and they are likely to occupy a restricted range of only a few square kilometres within the coastal fringe, with a strong association with mangroves and adjacent mudflats (Stevens et al. 2008). Sawfishes feed close to the benthos on a variety of teleost fishes and benthic invertebrates, including cephalopods, crustaceans and molluscs (Compagno & Last 1999, Last & Stevens 2009, Pogonoski et al. 2002, Thorburn et al. 2007, 2008).

Baseline surveys undertaken for Chevron's Wheatstone project identified green sawfish habitat and nursery area for juveniles within the north-eastern lagoon of the Ashburton Delta and in Hooley Creek near Onslow. Distribution of sawfish in these creeks is spatially and seasonally variable due to changing tidal and environmental conditions. However, they typically return to inshore waters to breed and pup during the wet season (i.e. January) (Chevron 2011).

The relevant sawfish BIAs in the EMBA are detailed in Table 3.

### 5.3.7. Scalloped Hammerhead Shark

The scalloped hammerhead shark (*Sphyrna lewini*) is listed as conservation dependent under the EPBC Act and may be found within the EMBA. Globally distributed, in Australia, scalloped hammerhead sharks are found in both coastal and oceanic environments, in warm-temperate to tropical waters typically across the northern coastline.

There are no aggregation sites identified for scalloped hammerhead sharks in the EMBA, however juveniles of the species utilise shallower nearshore habitats of northern Australia, and there are some indications that there may be important nursery habitats in the area. As a species that is slow to mature and has low fecundity, the scalloped hammerhead shark is vulnerable to overfishing, with its unique head morphology also increasing its likelihood of capture as bycatch in net fisheries. Although no longer targeted by commercial fisheries, global population declines have prompted recent changes to national and state-based approaches to stock management, including total allowable catch limits (Northern Territory) or complete prohibition of take (Queensland) (DCCEEW, 2024a).

No scalloped hammerhead shark BIAs were identified in the EMBA.

### 5.3.8. Little Gulper Shark

The little gulper shark (*Centrophorus uyato*) is listed as conservation dependent under the EPBC Act and may be found within the EMBA. The little gulper shark is a small, deepwater shark that is endemic to the continental shelf waters of southern Australia, occurring on the upper-slope in depths between 180 and 900 m. Genetic studies have suggested that there are likely to be three distinct stocks of little gulper shark , with the western stock distributed from the western GAB to southern Western Australia, overlapping with the EMBA. Similar to other shark species, southern dogfish are vulnerable to overfishing due to their life history characteristics of being slow to mature and having low fecundity, with southern dogfish thought likely to have some of the lowest fecundity rates of all sharks. Although there are no accurate species-specific data on the historic take of little gulper shark, they are caught incidentally by commercial fisheries. However, the current areas targeted by these sectors are unlikely to have substantial overlap with little gulper shark.

No little gulper shark BIAs were identified in the EMBA.

### 5.3.9. Narrow Sawfish

The narrow sawfish (*Anoxypristis cuspidata*) is listed as migratory under the EPBC Act. It is a marine or marginal (brackish water) species found from inshore waters to a depth of 40 m (Compagno et al. 2006). Though details of its ecology are not precisely known, it probably spends most of its time on or near the bottom in shallow coastal waters and estuaries. A study showed the narrow sawfish to be the most abundant amongst the sawfish sampled in the Gulf of Carpentaria (Peverell, 2005) which holds some consistency with the offshore distribution of the species as shown by a study of Northern Prawn Fishery by-catch. Peverell (2005) also used catch data of offshore surface net fisheries to conclude that narrow sawfish also inhabit the mid-water column and can thus be described as a benthopelagic animal. The narrow sawfish is known to form aggregations of mature females during the months of October to November. Its Australian distribution is unclear though it is most common in the Gulf of Carpentaria with southward ranges extending to Broad Sound in Queensland and the Pilbara Coast (circa 116°E), Western Australia (Last & Stevens 2009).

### 5.3.10. Giant Manta Ray / Reef Manta Ray

The giant manta ray appears to be a seasonal visitor to coastal or offshore sites. Giant manta rays are often seen aggregating in large numbers to feed, mate, or clean. Sightings of these giant rays are often seasonal or sporadic but in a few locations their presence is a more common occurrence. This species is not regularly encountered in large numbers and, unlike some other rays do not often appear in large schools (>30 individuals) when feeding. Overall, they are encountered with far less frequency than the smaller manta species, despite having a larger distribution across the globe (IUCN 2019).

The giant manta ray (*Mobula birostris*) occurs in tropical, sub-tropical and temperate waters of the Atlantic, Pacific and Indian Oceans. They are commonly sighted along productive coastlines with regular upwelling, oceanic island groups and particularly offshore pinnacles and seamounts. The giant manta ray is commonly encountered on shallow reefs while being cleaned or is sighted feeding at the surface inshore and offshore. It is also occasionally observed in sandy bottom areas and seagrass beds (IUCN 2019).

The reef manta ray (*Mobula birostris*) has a circumtropical and sub-tropical distribution, existing in the Pacific, Atlantic and Indian Oceans. Within this broad range, however, actual populations appear to be sparsely distributed and highly fragmented. This is likely due to the specific resource and habitat needs of this species.

Overall population size is unknown, but subpopulations appear, in most cases, to be small (about 100–2,000 individuals). A proportion of the individuals in some populations undertake significant coastal migrations (IUCN 2019). Since the species is migratory it is possible that individuals may be encountered in the operational area, however, given that they generally do not aggregate in large groups, high numbers are not expected to be encountered during the activities.

### 5.3.11. Oceanic Whitetip Shark

The oceanic whitetip shark (*Carcharhinus longimanus*) is listed as migratory under the EPBC Act. The oceanic whitetip shark is widespread throughout tropical and subtropical waters of the world (30° N to 35° S) (IUCN 2020). They are an oceanic and pelagic species that regularly occurs in waters of 18 to 28°C, usually >20°C (IUCN 2020). Within Australian waters, they are found from Cape Leeuwin (Western Australia) through parts of the Northern Territory, down the east coast of Queensland and New South Wales to Sydney (Last and Stevens 2009). They are usually found in surface waters, though can reach depths of >180 m (Castro et al. 1999). They have occasionally been recorded inshore but are more typically found offshore or around oceanic islands and areas with narrow continental shelves (Fourmanoir 1961, Last and Stevens 1994).

### 5.3.12. Shortfin Mako and Longfin Mako Sharks

The shortfin mako and longfin mako sharks are listed as migratory under the EPBC Act. The longfin mako is widely distributed but rarely encountered oceanic shark that ranges from Geraldton around the north coast to at least Port Stephens in New South Wales (DSEWPaC 2012). The shortfin mako is an oceanic and pelagic species, although they are occasionally seen inshore. They are found throughout temperate seas but are rarely found in waters colder than 16°C.

### 5.3.13. Porbeagle (Mackerel Shark)

The porbeagle (mackerel shark) (*Lamna nasus*) is listed as migratory under the EPBC Act. The porbeagle is wide-ranging, typically occurring in oceanic waters off the continental shelf, although they occasionally enter coastal waters (Francis et al. 2002 cited in DoE 2014e). The porbeagle is known to undertake seasonal migrations, although the timing and details of these migratory movements are not well understood (Saunders et al. 2011 cited in DoE 2014e).

## 5.4. Biologically Important Areas / Critical Habitat – Fishes and Sharks

BIAs are spatially defined areas where aggregations of individuals of a species are known to display biologically important behaviour such as reproduction, foraging, resting or migration. BIAs are identified by DCCEEW; however, they have no legal status, but are designed to assist decision making under the EPBC Act. They are not designed to identify protected areas but may inform such processes. Table 3 below provides an overview of BIAs in the EMBA for fish, sharks and rays.

The DCCEEW may make recovery plans for threatened fauna listed under the EPBC Act. The EPBC Act requires that 'habitat critical to the survival of the listed threatened species' is identified in recovery plans, and summary of relevant recovery plans is listed in Section 13.2. BIAs may overlap these sites but may be identified for other purposes. DCCEEW state that the criteria used to identify 'habitat critical to the survival of the species' are more complex than those used to identify BIA. Specifically, the Sawfish and River Sharks Multispecies Recovery Plan (DoEE 2015) cites that *"all areas where aggregations of individuals have been recorded displaying biologically important behaviour such as breeding, foraging, resting or migrating, are considered critical to the survival of the species unless population survey data suggests otherwise"*.

In addition, both the EPBC Act and WA BC Act and associated regulations (2018) provide for the listing of critical habitat - habitat 'critical to the survival of the threatened species'. To date no critical habitat in WA has been listed under either Act. No provision is made under the TPWC Act for listing critical habitat.

**Table 3: Biologically important areas – Fishes and Sharks**

| Species | Scientific name | Aggregation area and use | Specific geographic locations for species |
|---|---|---|---|
| Whale shark | *Rhincodon typus* | Foraging (high density prey) – Ningaloo Reef<br>Foraging – Wider Ningaloo Region | Ningaloo Marine Park and adjacent Commonwealth waters<br>Northward from Ningaloo along 200 m isobath |
| Dwarf sawfish | *Pristis clavata* | Foraging – Eighty Mile Beach<br>Nursing - Eighty Mile Beach<br>Pupping – Eighty Mile Beach | Eighty Mile Beach |
| Freshwater sawfish | *Pristis pristis* | Foraging –Roebuck Bay, Eighty Mile Beach<br>Pupping – Roebuck Bay, Eighty Mile Beach<br>Juvenile – Roebuck Bay | Eighty Mile Beach<br>Roebuck Bay |
| Green sawfish | *Pristis zijsron* | Pupping – Eighty Mile Beach, Roebuck Bay<br>Foraging - Roebuck Bay<br>Nursing - Eighty Mile Beach | Eighty Mile Beach<br>Roebuck Bay |

# 6. Marine Reptiles

Twelve species of listed marine reptiles under the Commonwealth EPBC Act are known to occur in Australian waters in the EMBA, according to the Protected Matters search (Appendix D of the EP). An examination of the species profile and threats database (DoEE 2019) showed that some listed reptile species are not expected to occur in significant numbers in the marine and coastal environments in the EMBA due to their terrestrial distributions. Hence, these species are not discussed further.

Of the remaining reptile species identified in the Protected Matters search (Appendix D of the EP), nine are listed as threatened and one additional species is listed as migratory. These species are show in Table 4 along with their WA conservation listings (as applicable)[3]. BIAs within the EMBA area discussed in Table 6.

[3] An overview of WA fauna conservation codes is provided in **Section 5** (fish and sharks).

**Table 4: EPBC listed marine reptile species in the EMBA**

| Species | Conservation Status | | | | Likelihood of occurrence in EMBA | BIA in EMBA |
|---|---|---|---|---|---|---|
| | EPBC Act 1999 | BC Act 2016 | Other WA Conservation Code | TPWC Act 1976 | | |
| Green turtle (*Chelonia mydas*) | Vulnerable Migratory | Vulnerable | - | Listed nationally | Breeding known to occur within area | Yes – refer to Table 6 |
| Flatback turtle (*Natator depressus*) | Vulnerable Migratory | Vulnerable | - | Listed nationally | Breeding known to occur within area | Yes – refer to Table 6 |
| Hawksbill turtle (*Eretmochelys imbricata*) | Vulnerable Migratory | Vulnerable | - | Vulnerable | Breeding known to occur within area | Yes – refer to Table 6 |
| Loggerhead turtle (*Caretta caretta*) | Endangered Migratory | Endangered | - | Vulnerable | Breeding known to occur within area | Yes – refer to Table 6 |
| Olive ridley turtle (*Lepidochelys olivacea*) | Endangered Migratory | Endangered | - | Vulnerable | Breeding known to occur within area | Yes – refer to Table 6 |
| Leatherback turtle (*Dermochelys coriacea*) | Endangered Migratory | Vulnerable | - | Critically Endangered | Breeding likely to occur within area | Yes – refer to Table 6 |
| Short-nosed seasnake (*Aipysurus apraefrontalis*) | Critically Endangered | Critically Endangered | - | - | Species or species habitat known to occur within area | None - No BIA defined |
| Leaf-scaled seasnake (*Aipysurus foliosquama*) | Critically Endangered | Critically Endangered | - | - | Species or species habitat known to occur within area | None - No BIA defined |
| Salt-water crocodile (*Crocodylus porosus*) | Migratory | Migratory | - | - | Species or species habitat likely to occur within area | None - No BIA defined |
| Dusky sea snake (*Aipysurus fuscus)* | Critically Endangered | Critically Endangered | - | - | Species or species habitat likely to occur within area | None - No BIA defined |

## 6.1. Marine Turtles

Six species of marine turtle occur in, use the waters, and nest on sandy beaches, in and around the EMBA. These are the green turtle (*Chelonia mydas*), flatback turtle (*Natator depressus*), hawksbill turtle (*Eretmochelys imbricata*), loggerhead turtle (*Caretta caretta*), olive ridley turtle (*Lepidochelys olivacea)* and leatherback turtle (*Dermochelys coriacea*) (Table 4).

These six species are listed on the EPBC Act List of Threatened Species as either ‘endangered’ or ‘vulnerable’ and all six species are also listed as ‘migratory’. They are also listed as threatened species under the BC Act.

A summary of the different habitat types used during the various life stages of marine turtle species identified in the EMBA is given in Table 5.

**Table 5: Summary of habitat types for the life stages of the six marine turtle species in the EMBA (DSEWPaC, 2012b)**

| Life Stage | | Green turtle | Flatback turtle | Hawksbill turtle | Loggerhead turtle | Olive ridley turtle | Leatherback turtle |
|---|---|---|---|---|---|---|---|
| Post-hatchling | | Open ocean pelagic habitats (poorly studied for Australian populations) | Coastal waters (poorly studied for Australian populations) | Open ocean pelagic habitats (poorly studied for Australian populations) | Pelagic (poorly studied for Australian populations) | Pelagic (poorly studied for Australian populations) | Pelagic (no data for Australian populations) |
| Adult | Mating | Offshore from nesting beaches. | Currently unknown for North West Shelf region. | Offshore from nesting beaches. | Little is known for North West Shelf region but expected to occur either en-route or adjacent to nesting beaches. | Not recorded within North West Shelf region. | Not recorded within North West Shelf region. |
| | Nesting | Typically, high energy, steeply sloped beaches with deep sand and deep-water approach. | Typically, low-energy beaches that are narrow with a low to moderate slope. Beach approach obstructed by broad intertidal mud or limestone platforms. | Typically beaches close to nearshore coral reefs and sediment comprised of coarse sand and coral rubble. | Poorly studied for North West Shelf region by generally prefer high energy, relatively narrow, steeply sloped, coarse-grained beaches. | Not recorded within North West Shelf region. | Not recorded within North West Shelf region. |
| | Internesting | Shallow coastal waters within several km of nesting beach. Internesting buffers of 20 km identified around all nesting habitats. | Shallow nearshore waters within 5-60 km of nesting beach. Internesting buffers of 40-60 km identified around all nesting habitats. | Shallow coastal waters within several kilometres of nesting beach. Internesting buffers of 20 km identified around all nesting habitats. | Shallow coastal waters within several kilometres of nesting beach. Internesting buffers of 20 km identified around all nesting habitats. | Not recorded within North West Shelf region. Internesting buffers of 20 km identified around all nesting habitats. | Danger Point, Cobourg Peninsula. 20 km internesting buffer around nesting sites |
| | Foraging | Neritic habitats associated with seagrass and algae, and mangrove habitats. | Turbid, shallow inshore waters, subtidal, soft-bottomed habitats of the continental shelf. | Subtidal and intertidal coral and rocky reef habitats of the continental shelf. | Subtidal and intertidal coral and rocky reefs, seagrass and deeper soft-bottomed habitats of the continental shelf. | Many feed within continental shelf waters, however it is not known if others are pelagic, as with the east Pacific population. | Mostly pelagic but will forage close to shore and over continental shelf in temperate waters. |

### 6.1.1. Loggerhead Turtle

The loggerhead turtle (*Caretta caretta*) has a worldwide distribution, living and breeding in subtropical to tropical locations (Limpus 2008b). Breeding aggregations in Australia occur on both the east coast (Queensland and NSW) and the west. The annual nesting population in Western Australia is thought to be 3,000 females annually (Baldwin et al. 2003), and this is considered to support the third largest population in the world (Limpus 2008b). Loggerhead turtles have one genetic breeding stock within Western Australia (Commonwealth of Australia 2017a).

The WA distribution of sandy beach nesting areas extends from Shark Bay to the southern area of the North West Shelf, with occasional late summer nesting crawls recorded as far north as Barrow and Varanus Islands and the Lowendal and Rosemary Islands (DSEWPaC 2012d). Major nesting locations include the Muiron Islands, the Ningaloo Coast south to Carnarvon and the islands around Shark Bay, which includes Dirk Hartog Island, one of the principal nesting and internesting sites in WA (Limpus 2008). The Recovery Plan for Marine Turtles in Australia (2017) identifies the Muiron Islands (as a principal rookery), and all waters within a 20 km radius as habitat critical to the survival of loggerhead turtles (Commonwealth of Australia 2017a).

Estimates of up to 5,000 female loggerhead turtles have been predicted within the Ningaloo Marine Park and Muiron Islands Marine Management Area (Waayers 2010). Earlier surveys found higher proportions of nesting loggerheads in the southern areas of the reserves (CALM 2005a). Aerial surveys conducted in 2000 and 2001 in the Exmouth region recorded only 12 sightings in Commonwealth waters and these turtles were most likely loggerheads (BHP 2005). In a survey commissioned by Santos around the islands in the Exmouth Region, loggerhead turtles were recorded nesting on Flat Island north of the Exmouth Gulf which was the first time they had been recorded in that location (Astron 2014). Loggerhead reproduction occurs from November to March, with a peak in late December/early January (Limpus 2008b).

Foraging areas are widespread for loggerhead turtle populations and migrations from nesting to feeding grounds can stretch thousands of kilometres, including feeding grounds as far north as the Java Sea of Indonesia for the WA population (Limpus 2008b). Loggerhead turtles have also been sighted in the Christmas and Cocos (Keeling) Islands. Shark Bay has been identified as an important foraging habitat for loggerhead turtles (Commonwealth of Australia 2017a). Loggerhead turtles are carnivorous and feed primarily on benthic invertebrates from depths of up to approximately 50 m to near shore tidal areas including areas of rocky and coral reef, muddy bays, sand flats, estuaries and seagrass meadows (Limpus 2008b).

Loggerhead turtles from both WA and eastern Australian have been recorded foraging in the NT, and further afield in Indonesia and Papua New Guinea (Perez et al., 2022; Pendoley, 2023). In the Kimberley region, loggerhead turtles are thought to be transient or end-of-migration foragers with no documented nesting sites in the area (Tucker et al., 2021).

Figure 5 shows the BIAs for the loggerhead turtle within the EMBA.

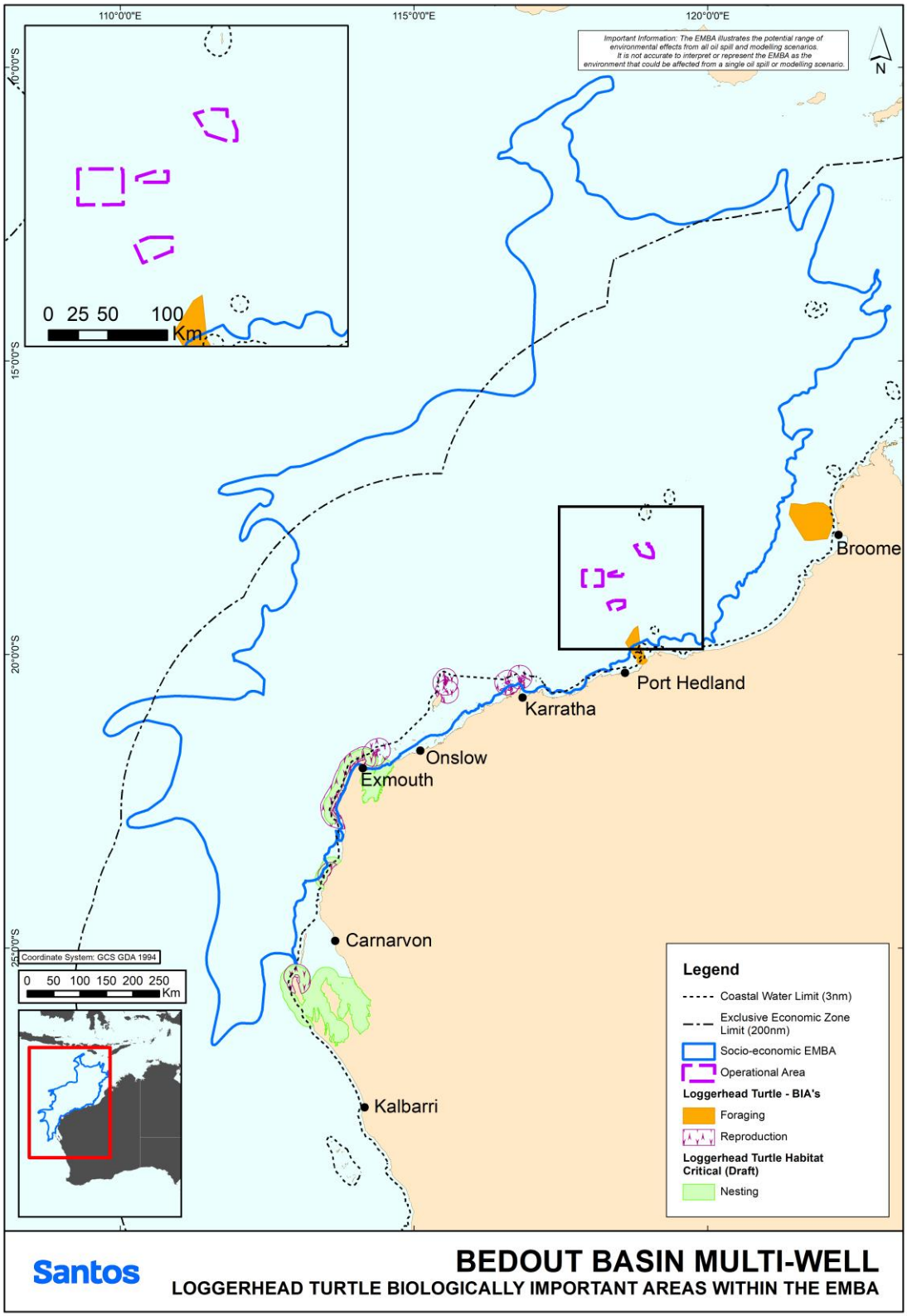



**Figure 5: Biologically Important Areas and Habitat Critical – Loggerhead Turtle**

### 6.1.2. Green Turtle

Australian population of green turtles is estimated to be approximately 70,000 and is divided into seven genetically distinct breeding aggregations. The species is widespread and abundant in WA and NT waters with an estimated 20,000 individuals occurring, arguably the largest population in the Indian Ocean (Limpus 2008a). There are three distinct breeding stocks in WA waters which include: the North west Shelf stock, the Scott-Browse stock and the Ashmore Stock (Commonwealth of Australia 2017a).

The North west Shelf population is one of the largest in the world and the most significant rookery is the western side of Barrow Island (Prince 1994, Limpus 2008a). Other principal rookeries include the Lacepede Islands, Montebello Islands, Dampier Archipelago, Browse Island and North West Cape (Prince 1994, Limpus 2008a, DSEWPaC 2012b). See Table 6 for a complete list.

Surveys by Waayers (2010) within the Ningaloo Marine Park and Muiron Islands Marine Management Area estimated up to 7,500 female green turtles used these areas. In 2014, Santos commissioned a survey of the islands in the Exmouth Region which found that North and South Muiron Islands were significant nesting sites for green turtles with over 100 green turtles nesting overnight on one beach at North Muiron Island (Astron 2014). The green turtle is also known to breed in large numbers in the dunes above the extensive beaches found on Serrurier Island, with counts indicating the island supports the second largest rookery in the Pilbara (Oliver 1990).

Lower density green turtle nesting has also been recorded on Jurabi coast, Thevenard Island, Lowendal Islands and in Exmouth Gulf (Limpus 2008a). Only low numbers of green turtles have been observed nesting on Varanus Island, as well as Airlie Island (Pendoley Environmental 2011). From monitoring undertaken in 2016/17 by Santos on Varanus Island; three green turtles were observed to nest over a four-week tagging effort (Astron 2017).

Green turtle nesting abundance and timing fluctuates significantly from year to year depending on environmental variables, locality and food availability (Pendoley Environmental 2011). Nesting of green turtles has been recorded from August to March on Serrurier Island (Woodside 2002), from December to March along coast adjacent to Ningaloo (CALM 2005a) and from October to February on Varanus Island (Pendoley Environmental 2011). On Barrow Island, mating aggregations may commence from October with peak nesting from December to January, with hatchlings emerging through summer and early autumn. However, nesting on Barrow Island has been recorded all year round (Chevron 2005 and 2008, Pendoley 2005). Nesting on the Scott Reef-Sandy Islet and Browse Island has been observed all year round with peaks between December and January (Commonwealth of Australia 2017a).

The re-nesting period for female green turtles is approximately five years (Hamann et al. 2002).

Green turtles spend the first five to ten years of their life drifting on ocean currents, before moving to reside in shallower benthic habitats, including tropical coral and rocky reefs and seagrass beds. Green turtles have been known to migrate more than 2,600 km between feeding and breeding grounds (Limpus 2008a).

Green turtles are omnivores, mainly feeding in shallow benthic habitats on seagrass and/ or algae, but are also known to feed on sponges, jellyfish and mangroves (Limpus 2008a). Green turtles are unlikely to forage or dwell within deeper offshore waters due to the water depths; however, they may occasionally migrate through it with 86 % of post-nesting turtles being found to migrate to neritic foraging grounds and 14 % having local residency to their rookery in Western Australia (Ferriera et al., 2020).

Ferriera et al. (2020) spatial examination of inter-nesting green turtles found the existing BIA for encompassed the spatial extent, however the BIA is likely largely underestimated for foraging areas.

Figure 6 shows the green turtle BIAs within the EMBA.

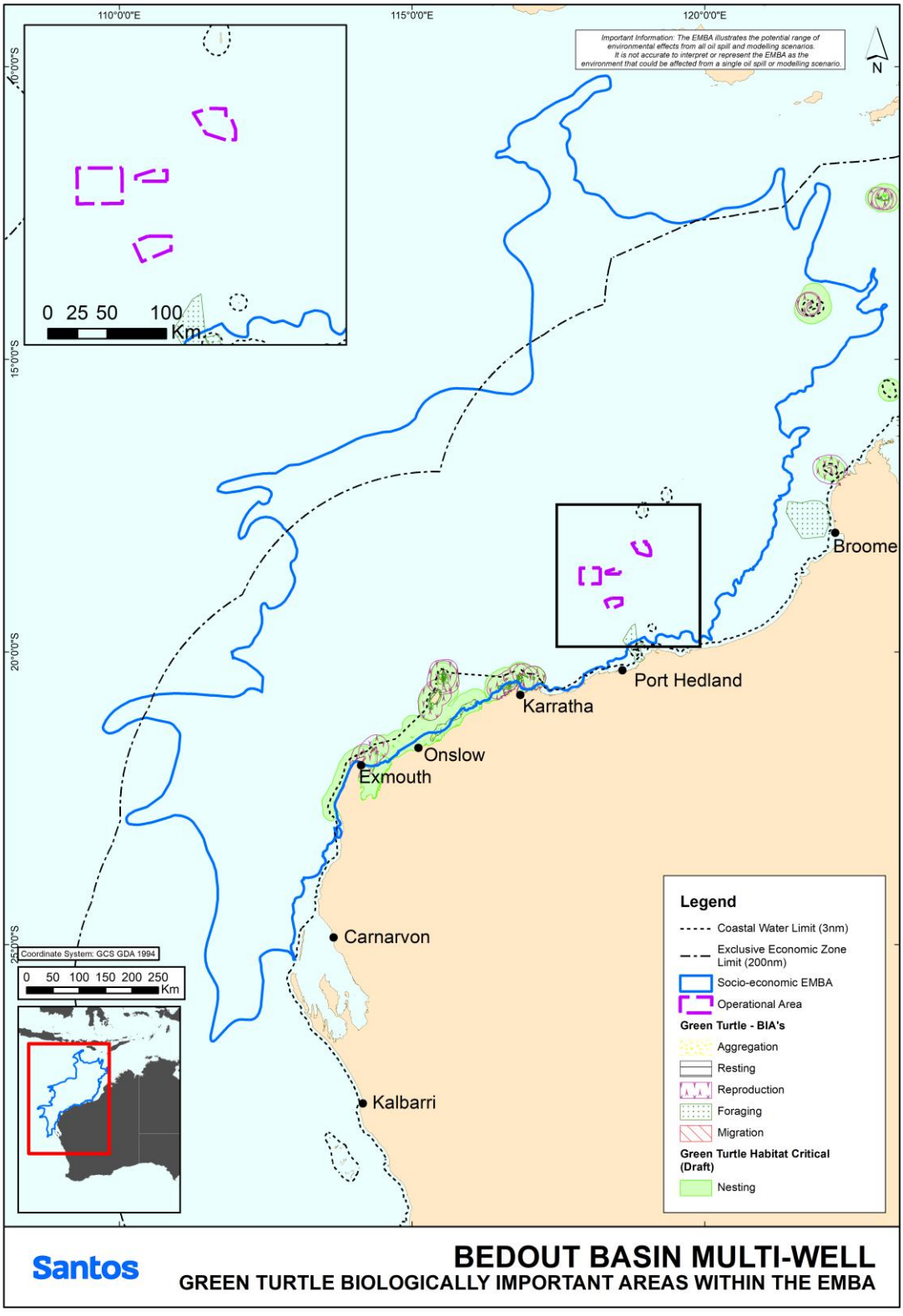



**Figure 6: Biologically Important Areas and Habitat Critical – Green Turtle**

### 6.1.3. Hawksbill Turtle

Hawksbill turtles (*Eretmochelys imbricata*) have a global distribution throughout tropical and sub-tropical marine waters. The Western Australian stock is concentrated on the North West Shelf (Dampier Archipelago) (Limpus 2009a) and is considered to be one of the largest hawksbill populations remaining in the world. The estimated number of nesting hawksbill turtles in WA waters is between 2,000 and 4,500 individuals (Morris 2004). There is a second major population of Hawksbill turtles in Australia, which is genetically isolated from the North West Shelf population located along the Northern Territory coast and north-eastern Queensland (Northern Territory Government, n.d).

In WA, their nesting range is relatively small and extends from the Muiron Islands to the Dampier Archipelago, a distance of approximately 400 km. The most significant breeding areas, that support hundreds of nesting females annually, are around sandy beaches within the Dampier Archipelago, Montebello Islands, Lowendal Islands and Barrow Island (Pendoley 2005, Limpus, 2009a).

The largest known nesting area for the North West Shelf population is the sandy shoreline of Rosemary Island, within the Dampier Archipelago, particularly on the north-western side of the Island. It is believed that the Rosemary Island rookery may support up to 1,000 nesting females annually (Limpus 2009). Low density nesting is also known from Barrow Island, Airlie Island, Muiron Islands and North West Cape/ Ningaloo coast (Cape Range) (Limpus 2009a). Nesting hawksbills have also been found on NE Regnard Island and SW Regnard Island, confirming the Regnard Islands as hawksbill rookeries (Pendoley Environmental 2009).

The hawksbill turtle nesting population within the Exmouth region is also considered important as the populations in Western Australia represent the largest remaining population in the Indian Ocean (CALM 2005). The best estimate of numbers within the Ningaloo Marine Park and Muiron Islands Marine Management Area is between 20–700 individuals (Waayers 2010).

A snapshot survey of Varanus Island and the Lowendal Islands conducted for Santos during October 2012 found the five most frequented beaches by hawksbills, based on the track counts, were Beacon Island (*n*=43), Parakeelya (*n*=41), Kaia (*n*=40), Rose (*n*=30) and Pipeline (*n*=28). Results of the October 2012 three-day track census program showed that Beacon Island also hosted the highest daily number of overnight emergences by hawksbills and is therefore an important nesting beach for hawksbill turtles (Pendoley Environmental 2013).

On Varanus Island, hawksbill turtle nesting activity is predominantly distributed on the island's east coast, including Pipeline, Harriet, and Andersons beaches (Pendoley Environmental 2019). Individual hawksbill turtles appear to show a strong fidelity to these beaches, often returning to the same beach to nest within the season (Pendoley Environmental 2019). Between 1986 and 2019, a total of 571 individual hawksbill turtles were tagged on Varanus Island. Recent baseline data was collected at the Montebello and Dampier AMPs by Keesing, 2019 showing that only one hawksbill turtle was identified during the survey at the Dampier AMP only. No marine turtle species were identified during the survey at Montebello AMP.

Nesting is reported to occur between October and February in WA (Commonwealth of Australia 2017a). Hawksbill turtles have been observed breeding on the North West Shelf between July and March with peak nesting activity around the Lowendal Islands between October and December (Limpus 2009a

Female hawksbills skip annual breeding opportunities (Kendall & Bjorkland 2001), presumably due to high energy demands of breeding (Chaloupka & Prince 2012).

Individuals may migrate up to 2,400 km between their nesting and foraging grounds (DSWEPaC 2012a), however a recent tagging study showed that turtles migrating from WA rookeries remain on the continental shelf (< 200 m depth) and within Australian waters during their inter-nesting, migrating and foraging phases (Fossette et al. 2021). Satellite tracking of nesting turtles on Varanus Island (32 km) and Rosemary Island has shown adult turtles to feed between 50 and 450 km from their nesting beaches (DSWEPaC 2012a).

Adults tend to forage in tropical tidal and sub-tidal coral and rocky reef habitat where they feed on an omnivorous diet of sponges, algae, jelly fish and cephalopods (DSWEPaC 2012a). Hawksbill turtles are unlikely to spend significant time within offshore waters as it is too deep to act as a feeding ground. However, it is likely they may migrate through those areas.

In order to better quantify and map the important areas used by Hawksbill turtles, AIMS was engaged in 2020 to lead the North West Shoals to Shores Research Program. During this program, AIMS available existing satellite tracking data for 20 adult turtles with data from newly deployed satellite tags on 20 adults in the Lowendal Islands and Dampier Archipelago (AIMS, 2021). Results showed that critical habitat designated by the Australian Government for inter-nesting largely protects the nesting areas calculated (AIMS, 2021), however the existing

foraging BIAs do not include the majority of foraging areas calculated (AIMS, 2021). While approximately 23% of the hawksbill turtles foraging distribution occurred within MPAs, the existing BIAs are largely underestimating the important foraging areas for the turtles (AIMS, 2021). This supports the results of a joint study conducted by Fossette et al. (Fossette et al. 2021), which found only 10% of foraging areas utilised by 42 nesting turtles (between 2000 and 2017) were encompassed by the designated foraging BIA. Fossette et al. (2021) found that the highest overlap of individual turtles occurred within the Migratory BIA corridor.

Figure 7 illustrates the BIAs for hawksbill turtle within the EMBA.

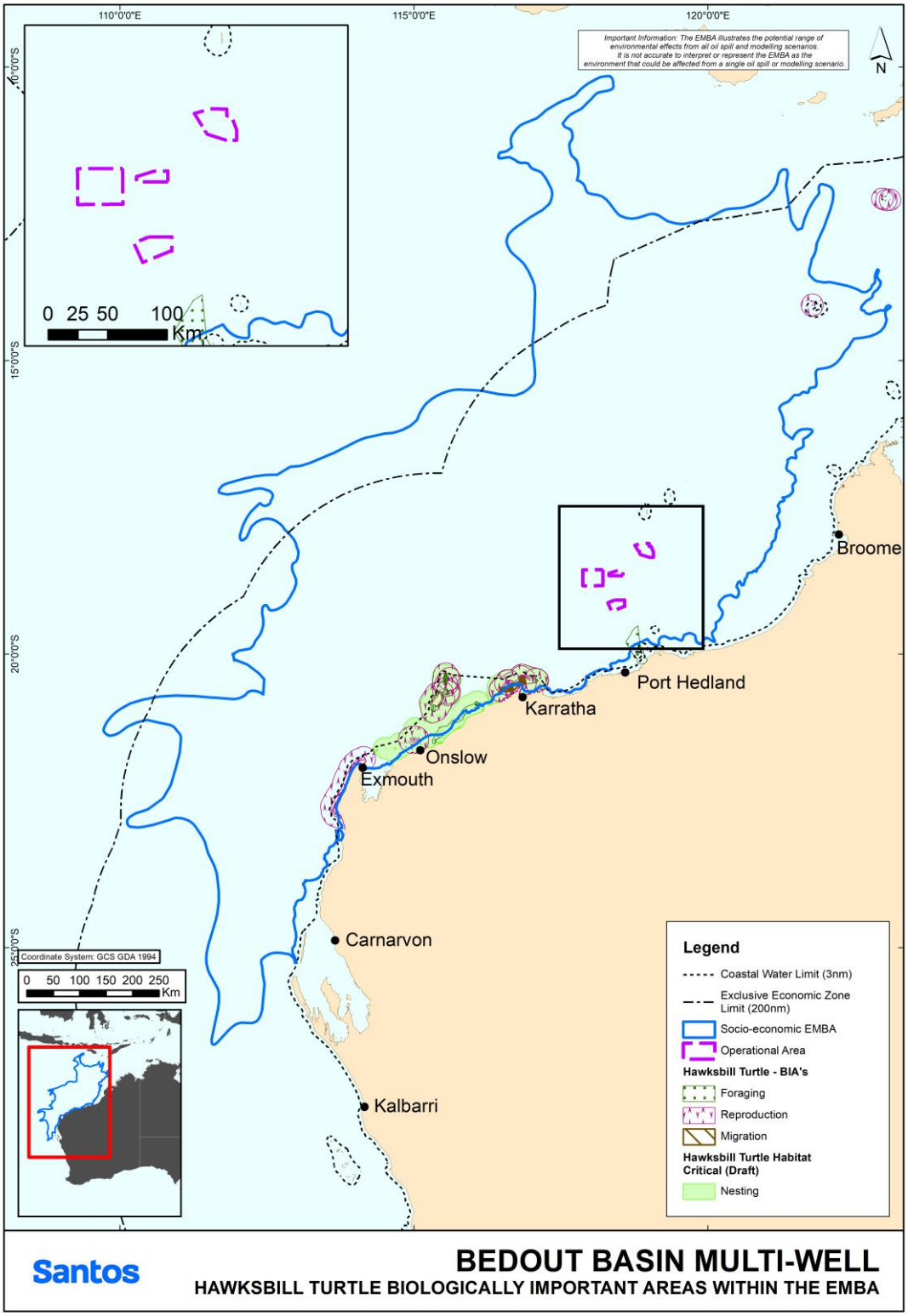



**Figure 7: Biologically Important Areas and Habitat Critical – Hawksbill Turtle**

### 6.1.4. Flatback Turtle

The flatback turtle (*Natator depressus*) has an Australasian distribution, with all recorded nesting beaches occurring within tropical to sub-tropical Australian waters. One third of the total breeding for the species occurs in Western Australia (WA) (Limpus, 2007). The management of the flatback turtle in Australia is broken up into five stocks currently described around Australia; eastern Queensland, Arafura Sea, Cape Domett, South-west Kimberley and Pilbara stocks (Commonwealth of Australia 2017). The Pilbara stock nests throughout the North West Shelf and is characterised by summer nesting (October to March), and the northern stock at Cape Domett breeds mainly in winter (July to September) (Commonwealth of Australia 2017a). The South-west Kimberley stock is also characterised by summer nesting.

The southern WA nesting population of flatback turtles occurs from Exmouth to the Lacepede Islands off the Kimberley coast (DSEWPaC 2012c). On the North West Shelf, significant rookeries are centred on Barrow Island especially the east coast beaches (DSEWPaC 2012b). NT populations are typically found in the Gulf of Carpentaria, western Torres Strait, Wellesley Islands Group and Sand Islet.

Montebello Islands, Thevenard Island, Varanus Island, the Lowendal Islands, King Sound and Dampier Archipelago are also significant rookeries (Pendoley 2005, Limpus 2007, Pendoley Environmental 2011). Nesting is also widespread along the mainland beaches from Mundabullangana on the Pilbara coast north, including Cemetery Beach near Port Hedland, Eighty Mile Beach and to Broome (Limpus 2007, DSEWPaC 2012b).

Long term monitoring of flatback turtles nesting in the Port Hedland area, specifically at Cemetery Beach and Pretty Pool Beach, was undertaken between 2004 and 2014. Monitoring results indicated the main nesting season of flatback turtles in the area was between mid-October and January, which is consistent with other rookeries in the Pilbara region including Barrow Island, Mundabullangana, Karratha and Onslow (Waayers and Stubbs 2016). The onset of the nesting season appears to be relatively consistent each year and is thought to be associated with the southern movement of warmer sea surface temperatures along the northern WA coast.

There have been occasional records of nesting by flatback turtles on the Jurabi Coast and Muiron Islands (CALM 2005). During turtle surveys for Santos, WA flatback turtle nesting was recorded on Bessieres Islands (Astron 2014), Serrurier, Flat, Table and Round Island in previous surveys (Pendoley Environmental 2009). Flatback turtle tracks have been seen on Forty Mile beach and evidence of flatback nesting was recorded on the same beach the next day (Pendoley Environmental 2009). Previously the status of the flatback population(s) was undetermined and although not well quantified, it was estimated to be many thousands of females (Limpus 2007). However, Pendoley et al. (2014a, b) reported both Barrow Island and Mundabullangana flatback turtles as substantial reproductive populations with estimates of 1,512 and 1,461 nesting females annually respectively. . Thevenard Island and Port Hedland were also identified as rookeries, but turtle nesting numbers are not known. .

Satellite tracking of adult (female) flatback turtles shows they use a variety of inshore and offshore marine areas off the east and west coasts of Barrow Island. Females inter-nest close to their nesting beaches, typically in 0–10 m of water (Chevron 2008). However, flatback turtles also travel approximately 70 km and inter-nest in shallow nearshore water off the adjacent mainland coast, before returning to Barrow Island to lay another clutch of eggs. The average inter-nesting period is 13–16 days.

From long-term tagging studies on Varanus Island and Pendoley's observations, it appears that the nesting season for flatback turtles peaks in December and January with subsequent peak hatchling emergence in February and March. Flatbacks have been observed to nest on Varanus Island between November and February (Chevron 2008, Pendoley Environmental 2011 & 2013). Population monitoring of flatback turtles on Varanus Island, calculated from 16 seasons, indicates a mean population estimate of 226 (+/- 97). Modelled flatback turtle populations have shown a slight decline from 2008/09 to 2016/17, which is considered to be part of fluctuations in the natural cycle (Astron 2017). Flatback turtles tend to nest on all beaches on Varanus Island (Astron 2017). Flatback hatching and emergence success is noted as higher compared to that reported for other Western Australian rookeries (Pendoley et al. 2014; cited Astron 2017).

Unlike other sea turtles, the flatback turtle lacks a wide oceanic dispersal phase and adults tend to be found in soft sediment habitats within the continental shelf of northern Australia (DSEWPaC 2012b). Despite having geographically large foraging ranges (>1500 km), genetic differentiation suggests strong natal homing for both males and females (Turner Tomaszewicz et al., 2022). Little information is known on the diets of flatback turtles (DSEWPaC 2012b); however, they are believed to forage on primarily soft-bodied invertebrates (Commonwealth of Australia 2017a). Flatback turtles also differ from other species of sea turtles in maturing at a larger size and a likely younger age (<20 years) in comparison to other sea turtle species, indicating they may have a more rapid growth rate in their juvenile (similar to the leatherback turtle, a species with their own family) (Turner

Tomaszewicz et al., 2022). This information from Turner Tomaszewicz et al., 2022 may provide valuable insight for ongoing population assessments and future recovery plans (Turner Tomaszewicz et al., 2022).

Figure 8 shows the BIAs for flatback turtles within the EMBA.

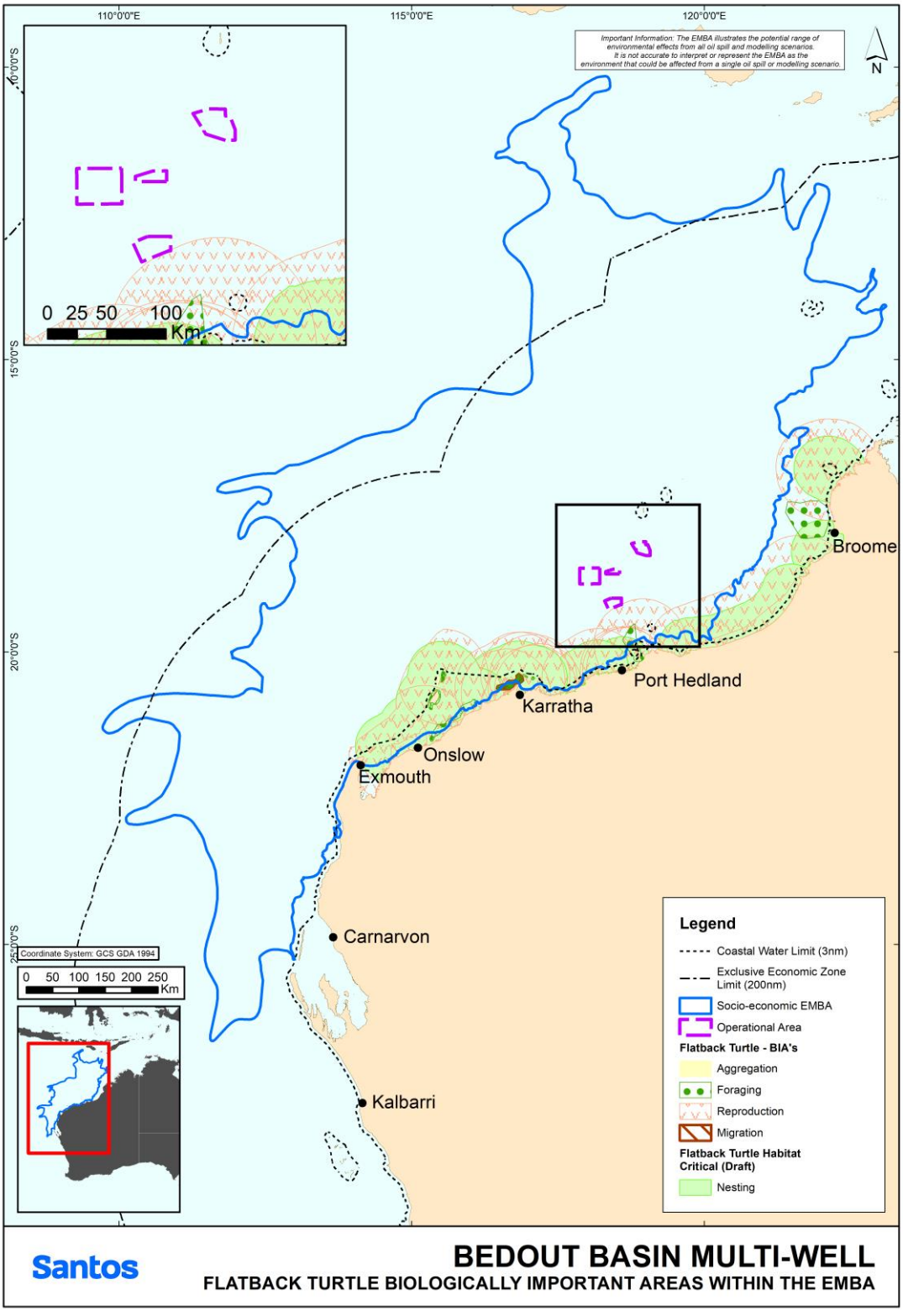



**Figure 8: Biologically Important Areas and Habitat Critical – Flatback Turtle**

### 6.1.5. Leatherback Turtle

The leatherback turtle *(*Dermochelys coriacea) has the widest distribution of any marine turtle and can be found from tropical to temperate waters throughout the world (Márquez 1990). There are no major leatherback turtle centres of nesting activity that have been recorded in Australia, although scattered isolated nesting (one to three nests per annum) occurs in southern Queensland and the Northern Territory (Limpus and McLachlin 1994).

There have been several records of leatherback turtles off the coast of WA and NT, but no confirmed nesting sites (Limpus 2009c). Turtle observations have mainly occurred south of the North West Shelf area and in open waters (>200 m deep) (Limpus 2009c). Due to the lack of nesting sites around Australian coastal waters, it is presumed that leatherback turtles observed in Australian waters are migrating from neighbouring countries to utilise feeding grounds in Australia (Limpus 2009c).

The leatherback turtle will feed at all levels of the water column and is carnivorous feeding mainly on pelagic, soft-bodied marine organisms such as jellyfish, which occur in greatest concentrations in areas of upwelling or convergence (DSEWPaC 2012d). The leatherback turtle is a highly pelagic species with adults only going ashore to breed.

No BIAs or critical habitats (draft) for the leatherback turtle were identified within the EMBA.

### 6.1.6. Olive Ridley Turtle

Olive ridley turtles (*Lepidochelys olivacea*) are the least common turtle species encountered with critical nesting habitat occurring outside of the EMBA, near Vulcan Island, Darcy Island, Prior Point and Llanggi and Cape Leveque (Commonwealth of Australia 2017).

The species is known to forage within the shallow benthic habitats of northern WA, however, it displays unusual behaviour patterns compared to other sea turtles, in being capable of deeper (up to 140 m), benthic and exceptionally long (>2 hour) dives (McMahon et al*.,* 2007). This trait, with their long-distance movement patterns (Polovina et al., 2004) is thought to be indicative of less specialist foraging (McMahon et al*.,* 2007). Olive Ridley turtles forage as far south as the Dampier Archipelago-Montebello Islands and is thought to feed primarily on gastropods and small crabs within the benthic, soft-bottomed communities of the continental shelf (Limpus 2009). Their extensive movements and variability in migration patterns suggest this species may be susceptible to a wide range of human activities (McMahon et al*.,* 2007).

No BIAs or critical habitats (draft) for the Olive Ridley Turtle were identified within the EMBA.

## 6.2. Seasnakes

Storr et al. (1986) estimate nine genera and 22 species of sea snakes occur in WA waters, with 25 listed marine seasnake species being recorded in the search area of WA and NT waters (Appendix A). Little is known of the distribution of individual species, population sizes or aspects of their ecology. Seasnakes are essentially tropical in distribution, and habitats reflect influences of factors such as water depth, nature of seabed, turbidity and season (Heatwole and Cogger 1993). Seasnakes are widespread throughout waters of the North West Shelf in offshore and nearshore habitats. They can be highly mobile and cover large distances or they may be restricted to relatively shallow waters and some species must return to land to eat and rest. In the north-west region of Western Australia, no BIAs have been designated for seasnakes.

Three species of seasnakes listed as threatened under the EPBC Act were identified in the Protected Matters search within the EMBA (Appendix D of the EP):

- Short-nosed seasnake (*Aipysurus apraefrontalis*)
- Leaf-scaled seasnake (*Aipysurus foliosquama*)
- Dusky seasnake (*Aipysurus fuscus*)

### 6.2.1. Short-nosed Seasnake

The short-nosed seasnake (*Aipysurus apraefrontalis*) is listed as critically endangered under the EPBC Act and the BC Act. It is a fully aquatic, small snake and is endemic to WA. It has been recorded from Exmouth Gulf, WA to the reefs of the Sahul Shelf, in the eastern Indian Ocean. This species is believed to show strong site fidelity to shallow coral reef habitats in less than 10 m of water, with most specimens having been collected from Ashmore and Hibernia reefs (Minton & Heatwole 1975, Guinea and Whiting 2005).

The species prefers the reef flats or shallow waters along the outer reef edge in water depths to 10 m (McCosker 1975, Cogger 2000). The species has been observed during daylight hours, resting beneath small coral overhangs or coral heads in 1–2 m of water (McCosker 1975). Guinea and Whiting (2005) reported that very few short-nosed seasnakes moved even as far as 50 m away from the reef flat and are therefore unlikely to be expected in high numbers in offshore, deeper waters.

#### 6.2.2. Leaf-scaled Seasnake

The leaf-scaled seasnake *(Aipysurus foliosquama)* is listed as critically endangered under the EPBC Act and the BC Act. It occurs in shallow water (less than 10 m in depth), in the protected parts of the reef flat, adjacent to living coral and on coral substrates (DoE 2014). The species is found only on the reefs of the Sahul Shelf in WA, especially on Ashmore and Hibernia Reefs (Minton and Heatwole 1975). The leaf-scaled seasnake forages by searching in fish burrows on the reef flat (DoE 2014).

#### 6.2.3. Dusky Seasnake

The dusky seasnake (*Aipysurus fuscus*) is listed as endangered under the EPBC Act. It occurs in hallow waters (less than 20 m in depth) in complex, hard coral reef and shoal ecosystems that have an extensive cover of healthy coral (DCCEEW, 2024b). The Scott Reef complex supports the largest known population of the dusky seasnake (DCCEEW, 2024b) . Historical recordings have occurred at Heywood Shoals, Ashmore Reef, Hibernia Reef and, Cartier Island and Seringapatam Reef (DCCEEW, 2024b) (all outside of the EMBA).

## 6.3. Crocodiles

The salt-water crocodile (*Crocodylus porosus*) is a migratory species under the EPBC Act and is also listed as a specially protected species (other specially protected fauna) under the BC Act. In WA, the species is found in most major river systems of the Kimberley, including the Ord, Patrick, Forrest, Durack, King, Pentecost, Prince Regent, Lawley, Mitchell, Hunter, Roe and Glenelg Rivers. The largest populations occur in the rivers draining into the Cambridge Gulf and the Prince Regent River and Roe River systems. There have also been isolated records in rivers of the Pilbara region, around Derby near Broome and as far south as Carnarvon on the mid-west coast (DEC 2009a).

## 6.4. Biologically Important Areas/Habitat Critical – Marine Reptiles

Table 6 provides an overview of BIAs in the EMBA for marine reptiles, as identified by the DAWE (Commonwealth) and critical habitats identified in associated recovery plans. The DAWE may make recovery plans for threated fauna listed under the EPBC Act. The EPBC Act requires that ‘habitat critical to the survival of the listed threatened species’ is identified in recovery plans, relevant recovery plans are listed in Section 13.2.In addition, both the EPBC Act and WA BC Act and associated regulations (2018) provide for the listing of habitat critical - habitat ‘critical to the survival of the threatened species. To date no habitat critical in WA has been listed under either Act.

**Table 6: Biologically Important Areas/Habitat Critical and geographic locations - reptiles**

| Species | Scientific name | Aggregation area and use | BIAs within EMBA | Habitat Critical within EMBA |
|---|---|---|---|---|
| Loggerhead turtle | *Caretta caretta* | Nesting, migration, foraging and internesting – islands and coastline of the Kimberley region and islands of the North West Shelf, Ningaloo coast and Jurabi coast | Cohen Island<br>Bedout Island<br>Lowendal Island<br>Montebello Island<br>Muiron Island<br>Ningaloo Coast and Jurabi coast<br>Rosemary Island | Exmouth and Ningaloo coast. 20 km internesting buffer<br>Gnaraloo Bay and beaches. 20 km internesting buffer<br>Shark Bay, all coastal and island beaches out the to the northern tip of Dirk Hartog Island. 20 km internesting buffer |
| Green turtle | *Chelonia mydas* | Nesting, migration foraging, aggregation, mating, basking and internesting – Offshore islands in the Browse Basin, North West Shelf and Kimberley/Pilbara coastlines<br>Mating/nesting – Dampier Archipelago<br>Basking – Middle Island | Ashmore Reef<br>Barrow Island<br>Coral reef habitat west of the Montebello group. Extends the entire length of Montebellos<br>Dampier Archipelago (islands to the west of the Burrup Peninsula)<br>De Grey River area to Bedout Island<br>Delambre Island<br>Dixon Island<br>Inshore tidal and shallow subtidal areas around Barrow Island<br>Middle Is. West Coast Barrow Island West Coast and North Coast<br>Montebello Island - Hermite Island, NW Island, Trimouille Island<br>Montebello Islands<br>North and South Muiron Island<br>North West Cape<br>Scott Reef<br>String of islands between Cape Preston and Onslow, inshore of Barrow Island | Scott Reef. 20 km internesting buffer<br>Dampier Archipelago. 20 km internesting buffer<br>Barrow Island, Montebello Islands, Serrier Island and Thevenard Island. 20 km internesting buffer<br>Exmouth Gulf and Ningaloo coast. 20 km internesting buffer |
| Hawksbill turtle | *Eretmochelys imbricata* | Nesting, migration, mating, foraging and internesting – Offshore islands in the Browse Basin, North West Shelf and Kimberley/Pilbara coastlines<br>Mating/ nesting/ internesting – Lowendal group, Montebello Islands | Barrow Island<br>Dampier Archipelago (islands to the west of the Burrup Peninsula)<br>De Grey River area to Bedout Island<br>Delambre Island (and other Dampier Archipelago Islands)<br>Dixon Island<br><br>Lowendal Island Group<br>Montebello Island - Hermite Island, NW Island, Trimouille Island<br>Ningaloo coast and Jurabi coast<br>Scott Reef<br>String of islands between Cape Preston and Onslow, inshore of Barrow Island<br>Thevenard Island<br>Varanus Island | Cape Preston to mouth of Exmouth Gulf (including Montebello Islands and Lowendal Islands). 20 km internesting buffer<br>Dampier Archipelago (including Delambre Island and Rosemary Island). 20 km internesting buffer |
| Flatback turtle | *Natator depressus* | Nesting, migration, mating, aggregation, foraging, internesting – Islands of the North West Shelf and the Pilbara/ Kimberley coastlines<br>Mating, nesting – Barrow Island | Eighty Mile beach<br>Barrow Island<br>Cape Thouin/ Mundabullangana/ Cowrie Beach<br>Coral reef habitat west of the Montebello group. Extends the entire length of Montebello Islands<br>Dampier Archipelago (islands to the west of the Burrup Peninsula)<br>De Grey River area to Bedout Island<br>Delambre Island<br>Dixon Island<br>Lacepede Island<br>Legendre Island, Huay Is<br>Montebello Island - Hermite Island, NW Island, Trimouille Island<br>North Turtle Island<br>Port Hedland, Cemetery Beach<br>Port Hedland, Paradise Beach<br>Port Hedland, Pretty Pool<br>String of islands between Cape Preston and Onslow, inshore of Barrow Is<br>Thevenard Island - South coast<br>West of Cape Lambert | Lacepede Islands. 60 km internesting buffer<br>Eighty mile Beach - coastal beach. 60 km internesting buffer<br>Cemetary Beach, Port Hedland. 60 km internesting buffer<br>Eco Beach - coastal beach near Broome. 60 km internesting buffer<br>Mundabullangana Beach. 60 km internesting buffer<br>Dampier Archipelago, including Delambre Island and Hauy Island. 60 km internesting buffer<br>Barrow Island, Montebello Islands, coastal islands from Cape Preston to Locker Island. 60 km internesting buffer |

# 7. Marine Mammals

Thirteen species of listed marine mammals are known to occur in Australian waters in the EMBA, according to the Protected Matters search (Appendix D of the EP). An examination of the species profile and threats database (DAWE 2020a) showed that some listed mammal species are not expected to occur in significant numbers in the marine and coastal environments in the EMBA due to their terrestrial distributions. Hence, these species are not discussed further.

Of the remaining listed species, four are listed as threatened and migratory and nine are listed as migratory under the Commonwealth EPBC Act (BIAs for marine mammals are discussed in Table 9. These species are shown in Table 7 along with their conservation listing under the WA BC Act and TPWC Act (as applicable).

The section below gives further details on marine mammal species listed as threatened and migratory and a summary is presented in Table 8. Identified BIAs are presented in Table 9.

**Table 7: Marine mammals listed as threatened or migratory under the EPBC Act**

| Species | Conservation Status | | | Likelihood of occurrence in EMBA | BIA in EMBA |
|---|---|---|---|---|---|
| | EPBC Act 1999 | BC Act 2016 | Other WA Conservation Code | | |
| Sei whale (*Balaenoptera borealis*) | Vulnerable Migratory | Endangered | - | Foraging, feeding or related behaviour likely to occur within area | None - No BIA defined |
| Blue whale (*Balaenoptera musculus*) | Endangered Migratory | Endangered | - | Migration route known to occur within area | Yes – Refer to **Table 9** |
| Fin whale (*Balaenoptera physalus*) | Vulnerable Migratory | Endangered | - | Foraging, feeding or related behaviour likely to occur within area | None - No BIA defined |
| Southern right whale (*Eubalaena australis*) | Endangered Migratory | Vulnerable | - | Species or species habitat likely to occur within area | Yes – Refer to **Table 9** |
| Humpback whale (*Megaptera novaeangliae*) | Migratory | Special conservation interest and Migratory | - | Breeding known to occur within area | Yes – Refer to **Table 9** |
| Sperm whale (*Physeter macrocephalus*) | Migratory | Vulnerable | - | Species or species habitat may occur within area | None in EMBA |
| Antarctic minke whale (*Balaenoptera bonaerensis*) | Migratory | Migratory | - | Species or species habitat likely to occur within area | None - No BIA defined |
| Bryde's whale (*Balaenoptera edeni*) | Migratory | Migratory | - | Species or species habitat likely to occur within area | None - No BIA defined |
| Killer whale (*Orcinus orca*) | Migratory | Migratory | - | Species or species habitat may occur within area | None - No BIA defined |
| Australian Humpback Dolphin (*Sousa sahulensis*) | Migratory (as *Sousa chinensis*) | Migratory | Priority 4 | Species or species habitat known to occur within area | None in EMBA |
| Spotted bottlenose dolphin (Arafura/Timor Sea populations) (*Tursiops aduncus*) | Migratory | Migratory | - | Species or species habitat known to occur within area | None in EMBA |

| Species | Conservation Status | | | Likelihood of occurrence in EMBA | BIA in EMBA |
|---|---|---|---|---|---|
| | EPBC Act 1999 | BC Act 2016 | Other WA Conservation Code | | |
| Irrawaddy dolphin (Australian snubfin dolphin) (*Orcaella heinsohni*) | Migratory | Migratory | Priority 4 | Species or species habitat known to occur within area | None in EMBA |
| Dugong (*Dugong dugon*) | Migratory | Migratory | - | Breeding known to occur within area | Yes – Refer to **Table 9** |

# 7.1. Threatened and Migratory Species

### 7.1.1. Sei Whale

Sei whales have a worldwide, oceanic distribution and migrate between low-latitude tropical and subtropical regions during the winter and temperate and subpolar latitudes in summer (Leaper et al. 2008). Sei whales tend to be found further offshore than other species of large whales (Bannister et al. 1996).

Sei whales move between Australian waters and Antarctic feeding areas; however, they are only infrequently recorded in Australian waters (Bannister et al. 1996) and their movements and distribution in Australian waters is not well known (DAWE 2020a). There are no known mating or calving areas in Australian waters (Parker 1978 in DAWE 2020a). The National Conservation Values Atlas currently record no BIAs for this species (DAWE 2020b). Surveys of the Bonney Upwelling (outside of the EMBA) between 2000 and 2003 recorded sightings of sei whales feeding during summer and autumn, indicating that this is potentially an important feeding ground (DAWE 2020b).

### 7.1.2. Blue Whale

Two sub-species of blue whale are recorded in Australian waters: the southern (or true) blue whale (*Balaenoptera musculus intermedia*) and the pygmy blue whale (*Balaenoptera musculus brevicauda*). Southern blue whales are believed to occur in waters south of 60°S and pygmy blue whales occur in waters north of 55°S (i.e. not in the Antarctic) (DEWHA 2008a). By this definition all blue whales in waters from Busselton to the NT are assumed to be pygmy blue whales and are discussed below.

Pygmy blue whale populations are distinguishable only acoustically as they do not display morphological differences (Leroy et al. 2021). Prior to 2020 there were believed to be three populations of the pygmy blue whale (B. m. brevicauda), however, evidence for a fourth pygmy blue whale acoustic population were found by Cerchio, S. et al. (2020), and a fifth was identified by Leroy et al. (2021).

Pygmy blue whales have a southern hemisphere distribution, migrating from tropical water breeding grounds in winter to temperate and polar water feeding grounds in summer (Bannister et al. 1996, Double et al. 2014), such as the Perth Canyon and adjacent waters (Rennie et al., 2009) and the Great Southern Australian Coastal Upwelling System (Möller et al., 2020). The WA migration path takes pygmy blue whales down the WA coast to coastal upwelling areas along southern Australia (Gill 2002) and south at least as far as the Antarctic convergence zone (Gedamke et al. 2007).

Tagging surveys have shown pygmy blue whales migrating northward relatively near to the Australian coastline (100 km) until reaching North West Cape after which they travelled offshore (240 km ) to Indonesia (Double et al., 2014). Passive acoustic data documented pygmy blue whales migrating along the Western Australian shelf break (Woodside 2012). Tagging data collected by Gales et al. (2010) has provided the first definitive link between the blue whales that feed off the Perth Canyon and those that occur around Indonesia. This is movement is concordant with the proposed ‘Tasmania to Indonesia’ population described by Branch et al. (2007).

The northern migration passes the Perth Canyon from January to May and north bound animals have been detected off Exmouth and the Montebello Islands between April and August (Double et al. 2012a, McCauley & Jenner 2010). A noise monitoring study conducted in 2014-15 recorded pygmy blue whales moving in a northward direction in August 2014 and between late-May to early July 2015 (JASCO Applied Sciences, 2016; McPherson, Craig et al., 2015). During the southern migration, pygmy blue whales pass south of the Montebello Islands and Exmouth from October to the end of January, peaking in late November to early December (Double et al. 2012b). No detections of the species were made during the period of their southward migration during the noise monitoring study.

Generally, they appear to travel as individuals or in small groups based on acoustic data. For example, analysis of pygmy blue whale calls from noise loggers deployed around Scott Reef (2006 to 2009) for the Woodside Browse project showed that 78% of the calls were from lone whales, 18% were from two whales and 4% were from three or more whales (McCauley 2011; Woodside 2014).

Pygmy blue whales appear to feed regularly along their migration route (i.e. at least once per week or more frequently) and are likely to have multiple food caches along their migratory route (e.g. Rowley Shoals and Ningaloo Reef) (ConocoPhillips 2018).

Recognised feeding areas of significance to this species, located within the EMBA include Ningaloo Reef (DoE 2015a). The Ningaloo Reef area has the capacity to offer feeding opportunities to pygmy blue whales through unique biophysical conditions able to support large biomasses of marine species (Double et al. 2014).

Surface lunge feeding of pygmy blue whales has been observed at North West Cape and Ningaloo Reef in June (C. Jenner & M-N Jenner, unpublished data, 2001 in Double et al. 2014). Outside of the recognised feeding areas, possible foraging areas for pygmy blue whales include the greater region around the Perth Canyon, off Exmouth and Scott Reef in WA (DoE 2015a). These steep gradient features tend to stimulate upwelling and, therefore increased productivity (seasonally variable) (ConocoPhillips 2018). Hence, they provide a favourable foraging area.

Breeding areas have not yet been identified; however, it is likely that pygmy blue whales calve in tropical areas of high localised production such as deep offshore waters of the Banda and Molucca Seas in Indonesia (Double et al. 2014, DAWE 2020a). There are no known breeding areas of significance to blue whales in the EMBA.

The BIAs for pygmy blue whale within the EMBA are detailed in Table 9 and depicted in Figure 9. However, a recent study by Thums et al. (2022) used a combination of passive acoustic monitoring of the Northwest Australian coast (46 instruments from 2006 to 2019) and satellite telemetry data (22 tag deployments from 2009 to 2021) to model the spatial extent of pygmy blue whale high use areas for foraging and migration and compared these areas to the BIAs. The synthesis of data indicated that pygmy blue whales extensively use the continental slope habitat rather than the continental shelf habitat off Western Australian coast compared to southern Australia.

Thums et al. (2022) described three important foraging (and/or resting/reproduction) areas, including; The Perth Canyon and vicinity, the shelf edge off Geraldton and; the shelf edge from Ningaloo Reef to the Rowley Shoals (not continuous).The study found that the Foraging BIA off the south-west of Western Australia encompassed 83 % of the most important areas in that region, however; the ‘Annual High Use Foraging’ BIA within that BIA only encompassed 7 % of the most important area.

The most significant overlaps were seen with the Migration BIAs, whereby the most important migration area had an 82 % overlap with the part of the Migration BIA that occurs in Australia. Thums et al. (2022) also stated that the available data indicated that the East Indian Ocean pygmy blue whales spent up to 124 days in Indonesian and Timorese waters (34 % of annual cycle) and this area may also be the calving ground for this population.

The Australian Government may now have to consider this quantitative assessment of important areas in future reviews of the BIAs (Thums et al. 2022).

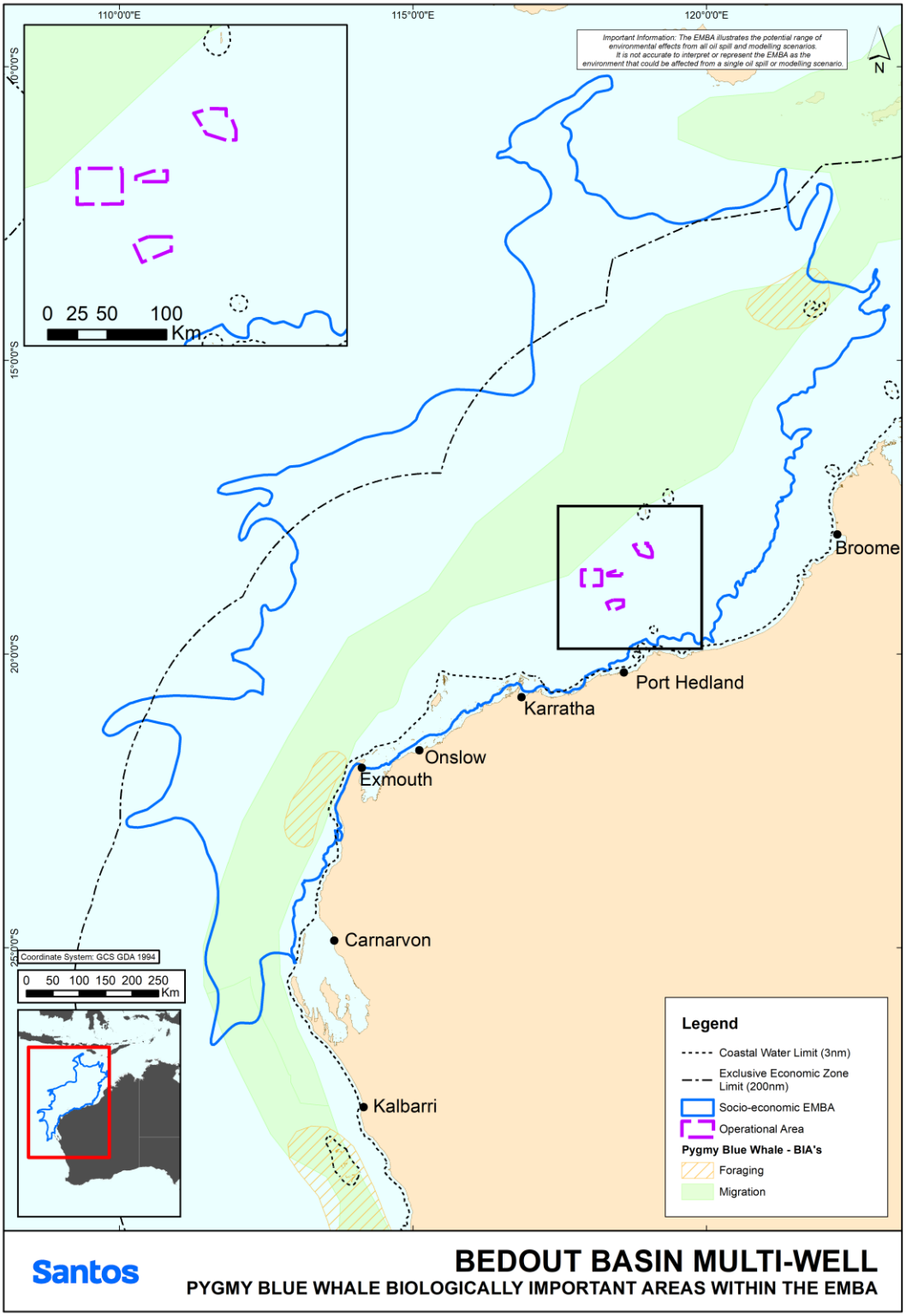



**Figure 9: Biologically Important Areas – Pygmy Blue Whale**

### 7.1.3. Fin Whale

Fin whales have a worldwide distribution generally in deeper waters, with oceanic migrations between warm water breeding grounds and cold-water feeding grounds.

The fin whale distribution in Australia is not clear due to the sparsity of sightings. Information is known primarily from stranding events and whaling records. According to the Species Profile and Threats database (DAWE 2020a); fin whales are thought to be present from Exmouth, along the southern coastline, to southern Queensland.

Migration paths are uncertain but are not thought to follow Australian coastlines (Bannister et al. 1996). There is insufficient data to prescribe migration times for fin whales. During summer and autumn this species has been recorded acoustically at the Rottnest Trench.

There are no known mating or calving areas in Australian waters (DoEE 2019a) and no BIAs for the fin whale are currently identified by the National Conservation Values Atlas (DAWE 2020b).

### 7.1.4. Southern Right Whale

The southern right whale is present in the southern hemisphere between approximately 30° and 60°S. The species feeds in the Southern Ocean in summer, moving close to shore in winter.

In Australian waters, southern right whales range from Perth, along the southern coastline, to Sydney. Sightings have been recorded as far north as Exmouth although these are rare (Bannister et al. 1996).

BIAs including migration areas are recorded for this species within the EMBA. Migration occurs along the WA coastline between April and October, with a couple of emerging aggregation areas at Flinders Bay and Hassell Beach (DSEWPaC 2012). Calving occurs within the Exmouth Gulf region (DAWE 2020). Further details on the BIA for southern right whale within the EMBA are provided in Table 9 and depicted in Figure 9 and Figure 10.

### 7.1.5. Humpback Whale

Humpback whales have a worldwide distribution, migrating along coastal waters from polar feeding grounds to subtropical breeding grounds. Geographic populations are distinct and at least six southern hemisphere populations are thought to exist based on Antarctic feeding distribution and the location of breeding grounds on either side of each continent (Bannister et al. 1996). The largest known population of humpback whales breeds along the coast of Western Australia (Branch, 2011, Salgado Kent et al., 2012, IWC, 2014) and has a recognised resting ground in the Exmouth Gulf (Ivine & Kent 2018). The population of humpback whales migrating along the WA coastline was recently estimated to be greater than 33,000 whales and likely increasing at exceptionally high growth rates between 10–12 % (Hedley et al. 2011, Salgado Kent et al. 2012).

Humpback whale populations have increased since being placed on the threatened species list for exploitation from whaling, resulting in a higher abundance of species off our Western Australian coastline. Effective from 26/02/2022, Humpback whales are no longer classed as vulnerable under the EPBC Act, however; they remain a Matter of National Environmental Significance as a listed Migratory Species and Cetacean under EPBC Act Division 3, where it is an offence to kill, injure, take, trade, keep, move or interfere with a cetacean. Humpback whales have been able to thrive and increase in numbers despite the heavy oil and gas exploration. A study presented by Bejder et al. (2016) has prompted a review of the species being down listed under Commonwealth legislation and regulations, as they are not eligible for listing as a threatened species under all statutory criteria. The west coast Australian humpback whale population migrates from Southern Polar Ocean ‘summer’ feeding grounds to their northern tropical ‘winter’ calving/ breeding grounds in coastal waters of the Kimberley. The northern migration tends to follow deeper waters of the continental shelf, whilst the southward migration concentrates whales closer to the mainland (Jenner et al. 2001; Irvine et al., 2018). Recent satellite tagging of southbound humpback whales indicate that whales generally migrated close to the coastline, within a few tens of kilometres of shore and in a corridor frequently less than 100 km (Double et al. 2010). Aerial surveys and noise logger recordings undertaken for Chevron’s Wheatstone Project indicated that the main distribution of humpback whales was sighted at an average distance of 50 km from the mainland during the northern migration and 35 km during the southbound migration (RPS 2010a). Woodside have conducted aerial surveys that have confirmed that the reported distribution of migrating humpback whales off the North West Cape is consistent with baseline surveys first conducted in 2000 to 2001 (RPS, 2010 in Woodside 2020).

The precise timing of the migration varies between years by up to six weeks, influenced by water temperature, sea ice distribution, predation risk, prey abundance and the location of feeding grounds (DEWR 2007).

Peak northward migration across the North West Shelf is identified as from late July to early August, and peak southward migration from late August to early September (DoEE 2015c). Data collected between 1995 and 1997 by the Centre for Whale Research indicates that the period for peak northern migration into the calving grounds in the Kimberley is mid to late July. The peak for southern migration is in the first half of September (Jenner et al. 2001). Actual timing of annual migration may vary by as much as three weeks from year to year due to food availability in the Antarctic (DMP 2003).

Satellite tagging data collected for migrating northbound humpback whales identified a consistent narrow inshore distribution, unlike the southward migration. There was little evidence that the whales tended to venture further from shore and into deeper water at any point on their northward migration. Whales were seen with calves off the North West Cape outside the 'calving grounds; of Lacepede Islands to Camden Sound. This indicates some potential for this area being used as a 'calving site' as well as a migratory corridor. Consequently, the region from the Lacepede Islands to Camden Sound should not be seen as the exclusive 'calving ground' for this population (Double et al. 2012b).

Details on the BIA for humpback whales within the EMBA are provided in Table 9 and depicted in Figure 11.

### 7.1.6. Sperm Whale

Sperm whales typically occur in WA along the southern coastline between Cape Leeuwin and Esperance (Bannister et al. 1996). Sperm whales are distributed worldwide in deep waters (greater than 400 m) off continental shelves and sometimes near shelf edges, averaging 20 to 30 nautical miles offshore (Hooker et al.1999, Pirotta et al., 2011). The sperm whale is known to migrate northwards in winter and southwards in summer, however, detailed information on the distribution of sperm whales is not available for the timing of migrations. Sperm whales have been recorded in deep water off the North West Cape on the west coast of Western Australia (RPS 2010b) and appear to occasionally venture into shallower waters in other areas (RPS 2010b). No BIAs for the sperm whale are located with the EMBA**.**

### 7.1.7. Antarctic Minke Whale

The Antarctic minke whale is distributed throughout the Southern Hemisphere from 55°S to the Antarctic ice edge during the austral summer and has been recorded in all Australian States (Bannister et al. 1996; Perrin & Brownell 2002). Detailed information on timing and location of migrations and breeding grounds on the west coast of Australia is largely unknown. However, it is believed that the Antarctic minke whale migrates up the WA coast to approximately 20°S during Australian winter to feed and possibly breed (Bannister et al. 1996).

### 7.1.8. Bryde's Whale

Bryde's whales (*Balaenoptera edeni;* Migratory) are distributed year-round across tropical and warm temperate waters with individuals recorded in all Australian states, except the NT (Ceccarelli et al., 2011; Kato 2002). The species typically moves between 40 °N and 40 °S, with these movements seeming to be primarily linked to prey availability (DoE, 2023k). Two forms are recognised: inshore and offshore Bryde's whales. It appears that the inshore form is restricted to the 200 m depth isobar whilst the offshore form is found in deeper waters of 500-1,000 m (DoEE 2019c). Both forms are expected to be found in zones of upwelling where they feed on shrimp like crustaceans (Bannister et al. 1996). Little is known about the population abundance of Bryde's whale, the location of exact breeding and calving grounds and large-scale migration patterns (DoEE 2019c). It is however, suggested that the offshore form migrates seasonally, heading towards warmer tropical waters during the winter.

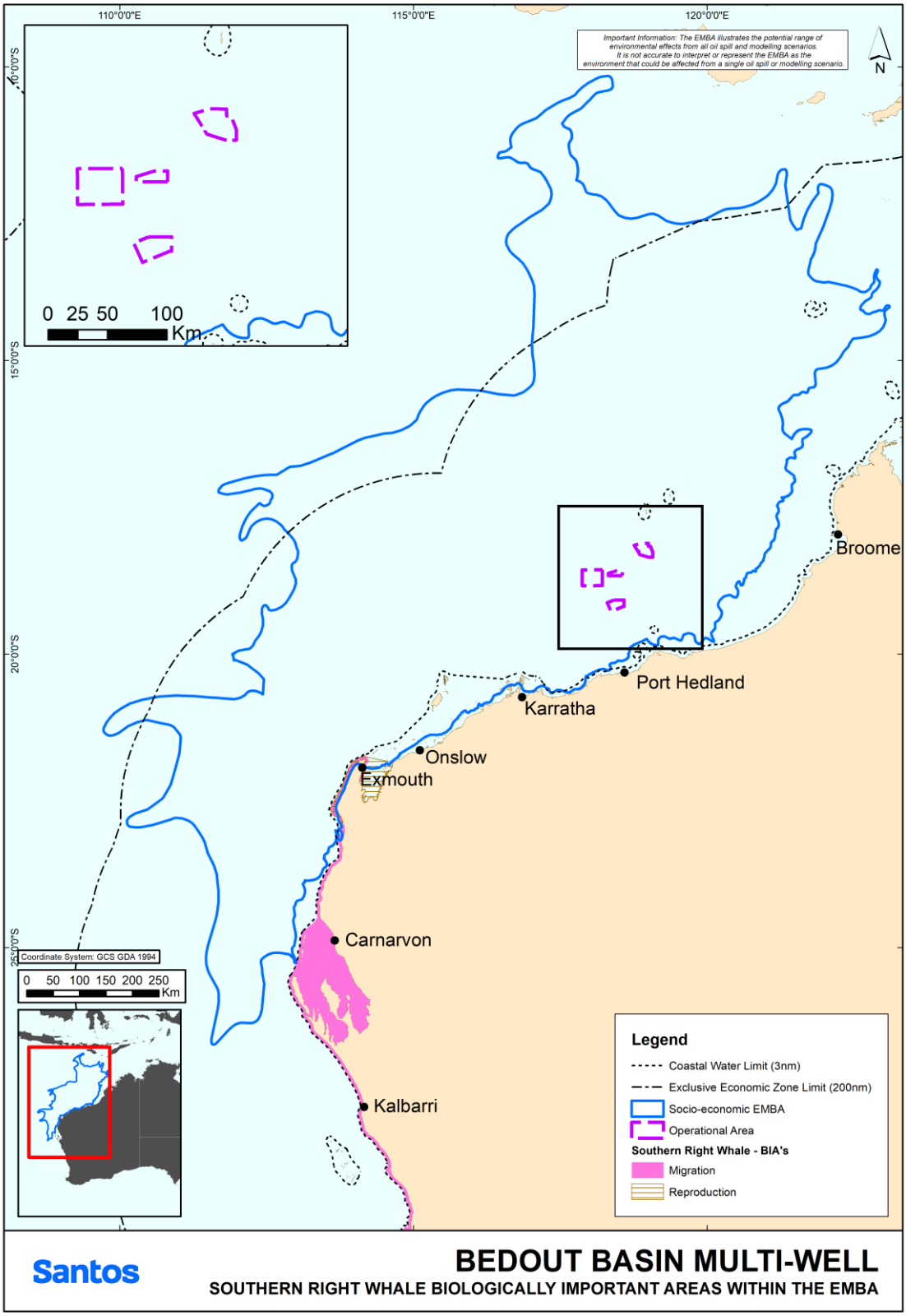



**Figure 10: Biologically Important Areas – Southern Right Whale**

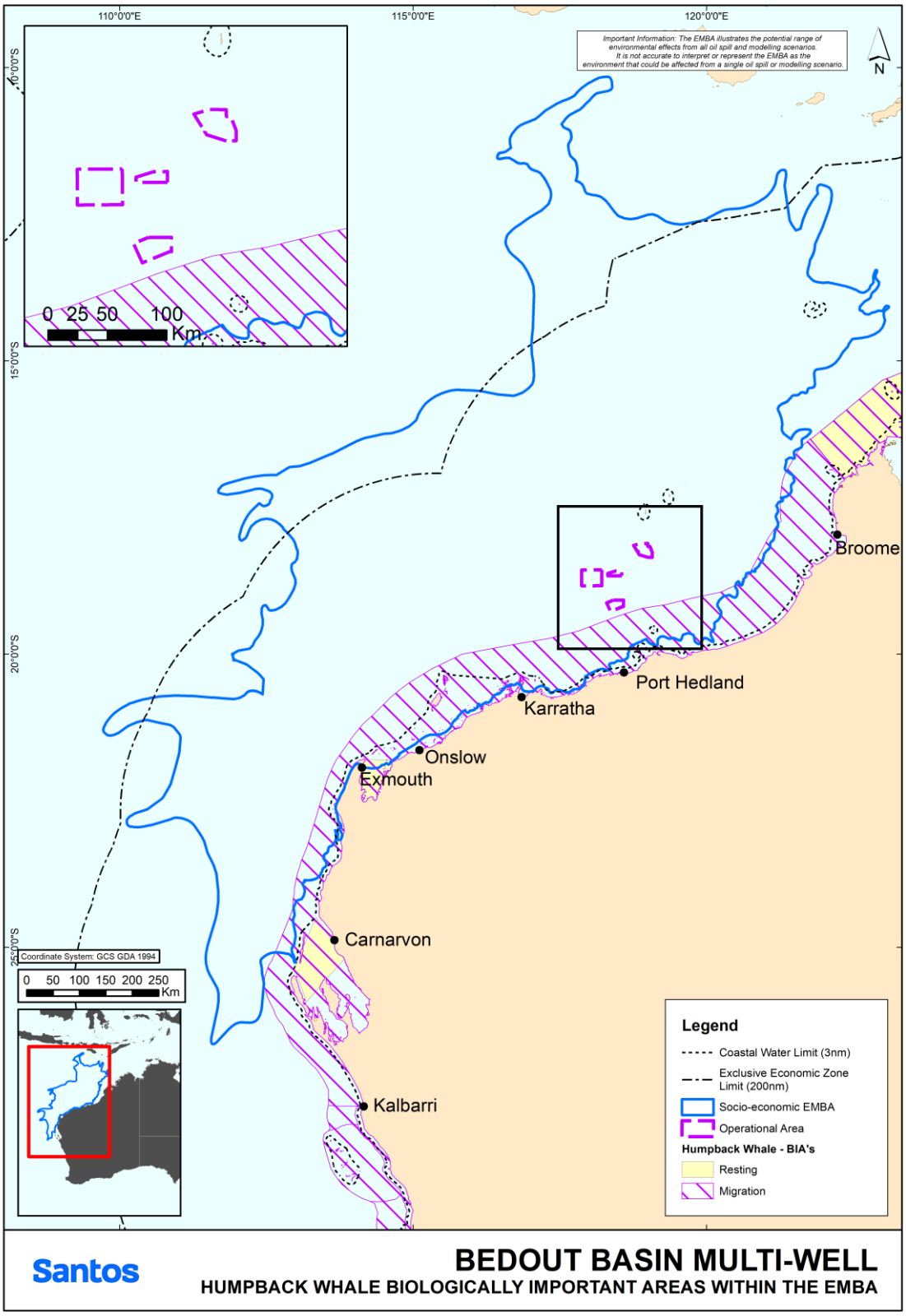



**Figure 11: Biologically Important Areas – Humpback Whale**

### 7.1.9. Killer Whale

The killer whale has a widespread global distribution and has been recorded in waters of all Australian states/territories (Bannister et al. 1996). Whilst more commonly found in cold, deeper waters, killer whales have been observed along the continental slope, shelf and shallower coastal areas. Killer whales are known to make seasonal movements and are most likely to follow the migratory routes of their prey, however, little is known about these movements (DoEE, 2019). They are more likely to be observed around seal colonies, with a significant seal colony within the EMBA being located in WA at the Abrolhos Islands.

### 7.1.10. Indo-Pacific Humpback Dolphin (Australian humpback dolphin)

The Indo-pacific humpback dolphin (*Sousa sahulensis*) is typically found in water less than 20 m deep but has been recorded in waters up to 40 m deep. This species is generally found in association with river mouths, mangroves, tidal channels and inshore reefs (DoEE 2016a). This species of dolphin is known to have resident groups that forage, feed, breed and calve in the state waters of Roebuck Bay, Dampier Peninsula, King Sound north, Talbot Bay, Anjo Peninsula, Vansittart Bay, Napier Broome Bay and Deception Bay (DoEE 2016a).

No Indo-Pacific humpback dolphin BIAs are located within the EMBA**.**

### 7.1.11. Spotted Bottlenose Dolphin (Indo-Pacific bottlenose dolphin)

The spotted bottlenose dolphin (*Tursiops aduncus*) (Arafura/ Timor Sea populations) is generally considered to be a warm water subspecies of the spotted bottlenose dolphin, occurring in shallow (often <10 m deep) inshore waters (Bannister et al., 1996; Hale et al., 2000). The known distribution of the spotted bottlenose dolphin extends from Shark Bay north to the western edge of the Gulf of Carpentaria in Australia (DoEE 2016b). No spotted bottlenose dolphin BIAs are located within the EMBA.

### 7.1.12. Irrawaddy Dolphin (Australian Snubfin Dolphin)

The Irrawaddy dolphin, also known as the snubfin dolphin (*Orcaella heinsohni*) is known to occur within the waters off northern Australia, extending north from Broome in Western Australia to the Brisbane River in Queensland (DoEE 2016c). Surveys have indicated that the species is typically found in protected shallow nearshore waters, generally less than 20 m deep, adjacent to river and creek mouths close to seagrass beds (DoEE 2016c). The snubfin dolphin was not recorded during any of the aerial surveys undertaken along the Dampier Peninsula coastline in the vicinity of James Price Point but were observed in Roebuck Bay from vessels on several occasions (RPS, 2010b). Based on the extensive survey effort and amenable conditions within the James Price Point coastal area during the survey, it is concluded that this species is seldom found outside of shallow and sheltered bays and inlets (DSD 2010). The population in Australian waters is thought to be continuous with the Papua New Guinea species but separate from populations in Asia. Breeding is thought to occur throughout the year for this species.

No BIAs for the Irrawaddy dolphin are located within the EMBA.

### 7.1.13. Dugong

The dugong (*Dugong dugon*) is a large herbivorous marine mammal (up to 3 m) that feeds off seagrass and generally inhabits coastal areas. Key populations along the WA coast are principally located at: Shark Bay (the largest resident population in Australia), Ningaloo Marine Park and Exmouth Gulf, the Pilbara coast and offshore areas including Montebello/ Barrow/ Lowendal Islands, and further north at Eighty Mile Beach and off the Kimberley Coast, particularly Roebuck Bay and Dampier Peninsula (Marsh et al. 2002; DSEWPaC 2012). Populations are also present at Ashmore Reef, and the north coast of the Tiwi Islands is recognised as a key site for the conservation of dugongs. A well-known major dugong aggregation of approximately 4,400 individuals occurs in waters seaward (within approximately 50 km) of the Tiwi Islands and ranks in the top eight of dugong populations in the world.

Dugong distribution and movement is based on the abundance, size and species of seagrass meadow. Dugongs can migrate hundreds of kilometres between seagrass habitats. Dugongs have been tracked moving long distances of up to 300 km between the Australia mainland and the Tiwi Islands (Whiting et al., 2009). Satellite-tracking data from dugongs tagged as part of the INPEX Ichthys Project baseline surveys observed that dugongs around the Vernon Islands, south of Melville Island, spent time in Darwin Harbour and around the Tiwi Islands (INPEX, 2010). Routine sightings occur in various locations along the NT coastline, including within Darwin Harbour, to the south of Melville Island.

Dugongs in the NT coastal waters have been observed foraging in intertidal rocky reef flats supporting sponges and algae as seagrass habitat is thought to be rare in the north marine region bioregion (INPEX, 2010; Whiting et al., 2009). However, seagrass communities are known to exist along the north coast of the Tiwi Islands. The dugong BIAs in the EMBA are detailed in Table 9 and shown in Figure 12.

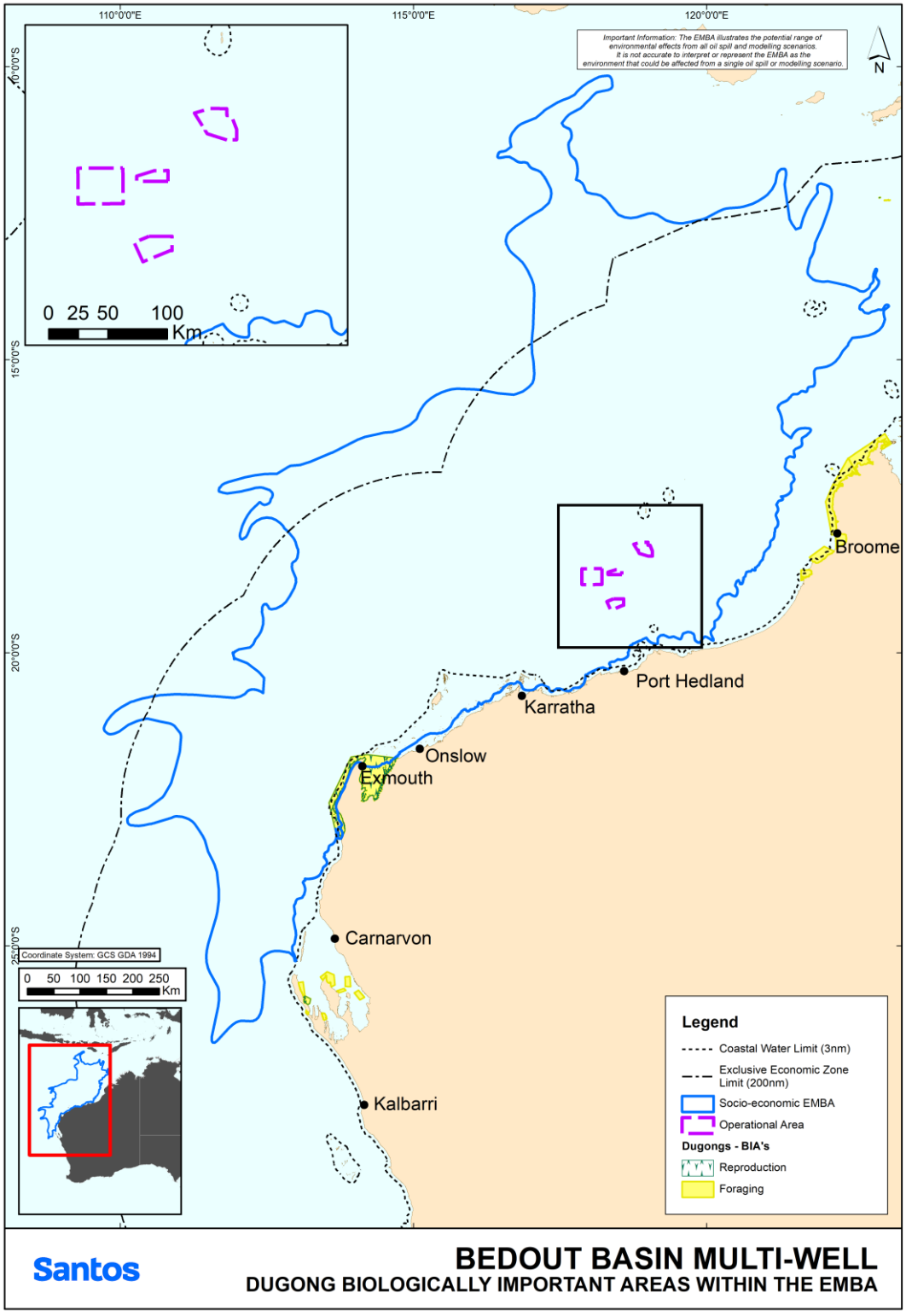



**Figure 12: Biologically Important Areas – Dugong**

**Table 8: Summary of information for marine mammals listed as threatened under the EPBC Act**

| Aspect | Sei whale | Pygmy blue whales | Fin whale | Southern right whale | Humpback whale | Australian sea lion |
|---|---|---|---|---|---|---|
| Species expected in area | Unknown | Yes | Unknown | Unlikely, southern distribution | Yes | Unlikely, southern distribution |
| Migration depth (m) | Unknown, prefers offshore waters | 500-1,000 | Unknown | N/A | Up to 100 | N/A |
| Migration seasonality | Unknown | Apr to Aug (north), Oct to Jan (south) | Unknown | Apr to Oct | Jun to Nov | N/A |

## 7.2. Biologically Important Areas / Critical Habitat – Marine Mammals

Table 9 below provides an overview of BIAs in the EMBA for marine mammals.

The DCCEEW may also make recovery plans for threated fauna listed under the EPBC Act. The EPBC Act requires that 'habitat critical to the survival of the listed threatened species' is identified in recovery plans, relevant recovery plans are listed in Section 13.2.

In addition, both the EPBC Act and WA BC Act and associated regulations (2018) provide for the listing of critical habitat - habitat 'critical to the survival of the threatened species. To date no critical habitat in WA has been listed under either Act. No provision is made under the TPWC Act for listing critical habitat.

**Table 9: Biologically Important Areas – marine mammals**

| Species | Scientific name | Aggregation area and use | BIAs within EMBA |
|---|---|---|---|
| Pygmy blue whales | *Balaenoptera musculus* | Migration – along the continental shelf edge off the WA coastline, extending offshore near Scott Reef and into Indonesian waters<br>Foraging – along Ningaloo reef, around Scott Reef<br>Distribution – along the WA coastline towards and beyond Indonesia. | Augusta to Derby. Tend to pass along the shelf edge at depths of 500 m to 1000 m; appear close to coast in the Exmouth-Montebello Islands area on southern migration.<br>Ningaloo<br>Scott Reef |
| Southern right whale | *Eubalaena australis* | Reproduction/calving – along the south west and southern coastline of WA/SA, Exmouth Gulf<br>Migration – along south west coast up to Exmouth Gulf | Exmouth Gulf |
| Humpback whale | *Megaptera novaeangliae* | Reproduction/calving/nursing/resting – Kimberley/Coastal North Lacepede Island, Campden Sound, Exmouth Gulf<br>Migration - northern migration deeper waters of the continental shelf, southward migration – along the WA mainland | Exmouth Gulf<br>Houtman Abrolhos Islands<br>Kimberley/Coastal North Lacepede Island, Camden Sound<br>North of Houtman Abrolhos<br>Shark Bay<br>The migration corridor extends from the coast to out to approximately 100 km offshore in the Kimberley region extending south to North West Cape. From North West Cape to south of Shark Bay the migration corridor is reduced to approximately 50 km. |
| Dugong | *Dugong dugon* | Foraging –Dampier Peninsula, , Exmouth and Ningaloo coastline<br>Migration – Roebuck Bay and North East Peron Peninsula<br>Reproduction/calving/nursing – Exmouth and the Ningaloo coastline | Exmouth Gulf<br>Kimberley coast, Dampier Peninsula<br>Middle Island, Kimberley coast<br>Pilbara and Kimberley coast near Dampier Peninsula |

# 8. Birds

Marine waters and coastal habitats in the EMBA contain key habitats that are important to birds, including offshore islands, sandy beaches, tidal flats, mangroves, and coastal and pelagic waters. These habitats support a variety of birds which utilise the area in different ways and at different times of the year (DSEWPaC 2012a). Birds can be broadly grouped according to their preferred foraging habitat as coastal/ terrestrial birds, seabirds, and shorebirds.

Coastal or terrestrial species inhabit the offshore islands and coastal areas of the mainland throughout the year. These species are either primarily terrestrial, or they may forage in coastal waters. Resident coastal and terrestrial species include osprey (*Pandion cristatus*), white-bellied sea eagle (*Haliaeetus leucogaster*), silver gull (*Larus novaehollandiae*) and eastern reef egret (*Egreta sacra*) (DEWHA 2008a).

Seabirds include those species whose primary habitat and food source is derived from pelagic waters. These species spend the majority of their lives at sea, ranging over large distances to forage over the open ocean. Seabirds present in the area include terns, noddies, petrels, shearwaters, tropicbirds, frigatebirds boobies and albatrosses (DEWHA 2008a).

Shorebirds, including waders, inhabit the intertidal zone and adjacent areas. Some shorebird species, including oystercatchers are resident (Surman & Nicholson 2013). Other shorebirds are migratory and include species that utilise the East Asian–Australasian Flyway, a migratory pathway for millions of migratory shorebirds that travel from Northern Hemisphere breeding grounds to Southern Hemisphere resting and foraging areas. Shorebirds that regularly migrate through the area include the Scolopacidae (curlews, sandpipers etc.) and Charadriidae (plovers and lapwings) families.

Surveys in the area by Santos and other agencies have built a picture of diverse avifauna. A summary of research is discussed below, followed by information on threatened and migratory birds. Wetlands of international importance are discussed in Section 9.2.

## 8.1. Regional Surveys

### 8.1.1. Abrolhos Islands

The Abrolhos Islands are one of the most significant seabird nesting areas in the eastern Indian Ocean with over two million birds breeding on the islands and small rocky atolls in the Abrolhos (DoF 2012). The mixture of species is unique, as subtropical and tropical species, and littoral and oceanic foragers, share the breeding islands. A total of 95 bird species have been recorded as residents or visitors to the Abrolhos Islands. Of these 35 species are known to breed at the Abrolhos (DoF, 2012):

- Common noddy (rookery – Pelseart Island): The Abrolhos supports 80% of the Australian breeding population of the common noddy (*Anous stolidus*) with up to 250,000 common noddies breed at Pelsaert Island. These birds lay their eggs in spring, but the actual month can vary, depending on their food supply and the weather conditions existing in offshore waters (DoF 2012)
- Caspian tern (rookeries – Leo Island, West Wallabi Island and Pelsaert Island): Unlike other more social terns, Caspian terns (*Hydroprogne caspia*) are usually solitary nesters. There are less than 150 of these breeding at the Abrolhos, across 22 islands (DoF 2012)
- Wedge-tailed shearwaters (rookeries): The Abrolhos are the most important breeding sites in Australia for the wedge tailed shearwater (*Ardenna pacifica*), with between 500,000 and 1,000,000 of these birds breeding there every year, predominantly on West Wallabi Island. The wedge-tailed shearwater breeding colonies at the Abrolhos are the largest in Australia (DoF 2012)
- Bridled tern (rookeries – Gun Island, Leo Island, Pelsaert Island, Little North Island, Fisherman Islands, Beagle Islands and Penguin Island): Bridled terns (*Onychoprion anaethetus*) breed on 90 islands throughout the Abrolhos. These birds fly north for the winter, through Indonesia to waters around the Philippines. There are approximately 4,000 bridled terns who return to the Abrolhos around October every year to lay their eggs. Bridled terns nest on more islands in the Abrolhos than any other bird species (DoF, 2012)

- Osprey (nesting area – Pelseart Island): Up to 100 eastern ospreys (*Pandion cristatus*) nest at a number of sites throughout all three island groups at the Abrolhos, including nesting platforms made from converted rock lobster pots and stacked fishing equipment on jetties (DoF 2012)
- White-bellied Sea eagle (nesting area – West Wallabi Island): At the Abrolhos, there are up to 50 breeding white-bellied sea eagles (*Haliaeetus leucogaster*), spread across all three island groups (DoF 2012)
- Australian lesser noddy (feeding area and rookeries Morley Island, Wooded Island and Pelseart Island): In Australia the Australian lesser noddy is only known to breed in this area and is known to forage between the islands and the continental shelf edge
- Other areas rookeries identified for both the wedge-tailed shearwater and bridled tern within the south west area include Lancelin Island, Rottnest Island and Safety Bay.

#### 8.1.2. North West Cape

Avifauna surveys of the North West Cape have recorded 144 bird species, one third of which are seabirds and shorebirds (resident and migratory) (May et al. 1983). Approximately 33 species of seabirds and shorebirds are found in the Ningaloo Marine Park with the main breeding areas at Mangrove Bay, Mangrove Point, Point Maud, the Mildura wreck site and Fraser Island (CALM & MPRA 2005a).

#### 8.1.3. Muiron Islands and Exmouth Gulf Islands

Muiron Islands and Exmouth Gulf Islands are generally lacking in published bird observations data. Early indications from surveys commissioned by Santos in 2013/14 indicate that South and North Muiron Islands are regionally significant in terms of wedge-tailed shearwater (*Ardenna pacifica*) nesting, whilst Bessiers and Fly islands are also significant (Surman pers comm. 2013). Nine coastal/terrestrial species and 21 shorebirds were identified on the Muiron and Exmouth Gulf Islands during the first of these surveys and seven bird species were recorded nesting (Surman 2013).

#### 8.1.4. Dampier Archipelago/Cape Preston Region

The Dampier Archipelago/Cape Preston region is a nesting area for at least 16 species of seabirds. Many of the islands and rocks in the area are known breeding grounds for birds, including wedge-tailed shearwaters (*Ardenna pacifica*), Caspian terns (*Sterna caspia*), bridled terns (*Onychoprion anaethetus*) and roseate terns (*Sterna dougallii*). Small islands and islets such as Goodwyn Island, Keast Island and Nelson Rocks provide important undisturbed nesting and refuge sites, and Keast Island provides one of the few nesting sites for pelicans in WA (CALM & MPRA 2005).

#### 8.1.5. Barrow Island Group

Barrow Island and surrounding islands have a diverse avifauna comprising at least 119 species (Chevron 2010), including 11 resident land birds, eight resident seabirds, 17 seabirds, 22 species of migratory waders, six resident shorebirds and 43 irregular visitors (Surman 2003). The avifauna of Barrow Island is thus poor in terms of land birds and waterfowl compared to mainland areas of the Pilbara, but rich in migratory waders and seabirds. Compared to other nearby offshore islands, Barrow Island has substantially more migratory waders but fewer breeding seabirds (Surman 2003).

#### 8.1.6. Lowendal Island Group and Airlie and Serrurier Islands

The Lowendal Island Group has a diverse avifauna comprising 89 recorded species (Dinara Pty Ltd. 1991, Burbidge et al. 2000). Six species of resident land birds and six species of raptors have been recorded at the Lowendal Islands (Surman & Nicholson 2012). Up to fourteen seabird species have been observed at any one time during annual surveys of the Lowendal Islands between 2004 and 2012. Surveys at the Montebello Islands have recorded 70 bird species. This includes 12 species of seabirds and 14 species of migratory shorebirds (Burbidge et al. 2000). Wedge-tailed shearwaters have been identified to nest on Varanus, Airlie, Serrurier and Bridled Islands (Astron 2017a). Breeding participation on the islands appears to be largely influenced by pre-breeding oceanographic conditions (Astron 2017a). Monitoring in 2016/17 was undertaken by Santos and demonstrated the colony sizes for wedge-tailed shearwaters to be within or above previously reported ranges (Astron 2017a). This is informed though monitoring that has been undertaken under the Integrated Shearwater Monitoring Program (ISMP), established in 1994.

In 2016/17, areas of potential wedge-tailed shearwater nesting habitat were recorded on Varanus Island (5.53 ha) and Airlie Island (12.47 ha) and surrounding islands of Bridled (2.94 ha), Serrurier (130.89 ha), Abutilon (2.02 ha)

and Parakeelya (1.66 ha) (Astron 2017a). The number of wedge-tailed shearwater breeding pairs was also estimated for each of Varanus (1,492 +/- 702), Airlie (600 +/- 124), Bridled (1,039 +/- 342), Serrurier (23,240 +/- 4,341), Abutilon (317 +/- 210) and Parakeelya (172 +/- 138) islands (Astron 2017a).

Other seabird species utilising Abutilon, Beacon, Bridled and Parakeelya islands for nesting include bridled terns, silver gulls, crested terns and lesser crested terns. Monitoring for these seabirds in 2016/17 was also completed by Santos, with monitoring results concluded to support previous trends for all species. Bridled terns mainly utilise Abutilon, Bridled and Parakeelya islands for breeding, with smaller numbers noted on Beacon and Varanus Islands. The bridled terns have not been recorded on Airlie Island and only in very small numbers on Varanus Island (Astron 2017b).

Silver gull numbers appear to be growing across the region (2010/2011). However, reasons for this are unknown but considered possibly to be due to greater prey availability or immigration from the mainland (Astron 2017b). Silver gulls have been found to utilise Bridled, Parakeelya, Abutilon and Beacon islands longer term for breeding. Silver gulls have not been identified to nest on Varanus island and were only recorded nesting on Airlie island for the first time in 2016/17 since monitoring commencement in 2004/05 (Astron 2017b).

The crested tern and lesser crested tern are noted as nomadic breeders that appear to use a consistent subset of islands for breeding. In 2016/17, Beacon Island was the favourable nesting site for the crested tern and lesser crested tern (Astron 2017b). Surveys in the vicinity of Port Hedland (Bennelongia 2011) recorded 23 species of migratory shorebird between 2002 and 2011. Terrestrial/coastal and seabird species were not targeted. A total of 4,248 migratory shorebirds of 18 species were observed during the field survey in April 2011.

## 8.2. Threatened Species

A Protected Matters search of the EMBA identified 25 bird species (Appendix D of the EP) listed as threatened under the EPBC Act.

An examination of the Species Profile and Threats database (DAWE 2020a) and The Action Plan for Australian Birds (Garnet 2011) showed that some listed bird species are not expected to occur in significant numbers in the marine and coastal environments in the EMBA due to their terrestrial or southern distributions. Hence, these species are not discussed further.

EPBC Act threatened species expected to occur in the area are listed in Table 10 along with their WA conservation status (as applicable) and discussed below. There are an additional 25 migratory species listed under the EPBC Act, with these detailed in (Table 12). BIAs for birds are detailed in Table 16 and depicted in Figure 13.

**Table 10: Birds listed as threatened under the EPBC Act**

| Species | Conservation Status | | Other WA Conservation Code | Likelihood of occurrence in EMBA | BIAs in EMBA |
|---|---|---|---|---|---|
| | EPBC Act 1999 | BC Act 2016 | | | |
| **Shorebirds** | | | | | |
| Asian Dowitcher (*Limnodromus semipalmatus*) | Vulnerable, Migratory | Migratory | - | Species or species habitat known to occur within area | None - No BIA defined |
| Australian painted snipe (*Rostratula australis)* | Endangered | Endangered | - | Species or species habitat likely to occur within area | None - No BIA defined |
| Common greenshank (*Tringa nebularia*) | Endangered, Migratory | Migratory | - | Species or species habitat known to occur within area | None - No BIA defined |
| Curlew sandpiper[8] (*Calidris ferruginea*) | Critically endangered, Migratory | Critically endangered | - | Species or species habitat known to occur within area | None - No BIA defined |
| Eastern curlew[8] (*Numenius madagascariensis)* | Critically endangered, Migratory | Critically endangered | - | Species or species habitat known to occur within area | None - No BIA defined |
| Greater sand plover (*Charadrius leschenaultii)* | Vulnerable, Migratory | Vulnerable | - | Species or species habitat known to occur within area | None - No BIA defined |
| Northern Siberian bar-tailed godwit (*Limosa lapponica menzbieri)* | Critically endangered, Migratory[6] | Critically endangered, Specially protected (migratory)[6] | - | Species or species habitat known to occur within area | None - No BIA defined |
| Red knot[8] (*Calidris canutus*) | Endangered, Migratory | Endangered | - | Species or species habitat known to occur within area | None - No BIA defined |
| Sharp-tailed sandpiper (*Calidris acuminata*) | Vulnerable, Migratory | Migratory | - | Roosting known to occur within area | None - No BIA defined |
| **Seabirds** | | | | | |
| Abbott's booby (*Papasula abbotti)* | Endangered | - | - | Species or species habitat may occur within area | None - No BIA defined |
| Amsterdam albatross (*Diomedea amsterdamensis*) | Endangered, Migratory | Critically endangered | - | Species or species habitat likely to occur within area | None - No BIA defined |
| Australian fairy tern (*Sternula nereis nereis)* | Vulnerable | Vulnerable | - | Breeding known to occur within area | None - BIA not found in EMBA |
| Australian lesser noddy (*Anous tenuirostris melanops)* | Vulnerable | Endangered | - | Foraging, feeding or related behaviour known to occur within area | None - BIA not found in EMBA |
| Black-browed albatross (*Thalassarche melanophris)* | Vulnerable, Migratory | Endangered | - | Species or species habitat may occur within area | None - BIA not found in EMBA |
| Campbell albatross (*Thalassarche impavida)* | Vulnerable, Migratory | Vulnerable | - | Species or species habitat may occur within area | None - BIA not found in EMBA |
| Christmas Island white-tailed tropicbird (*Phaethon lepturus fulvus)* | Endangered | - | - | Species or species habitat may occur within area | None - No BIA defined |
| Grey falcon (*Falco hypoleucos*) | Vulnerable | Vulnerable | - | Species or species habitat known to occur within area | None - No BIA defined |
| Indian Ocean Red-tailed Tropicbird | Endangered | - | - | Breeding known to occur within area | None - No BIA defined |

| Species | Conservation Status | | Other WA Conservation Code | Likelihood of occurrence in EMBA | BIAs in EMBA |
|---|---|---|---|---|---|
| | EPBC Act 1999 | BC Act 2016 | | | |
| (*Phaethon rubricauda westralis*) | | | | | |
| Indian yellow-nosed albatross (*Thalassarche carteri)* | Vulnerable, Migratory | Endangered | - | Species or species habitat may occur within area | None - BIA not found in EMBA |
| Northern giant petrel (*Macronectes halli)* | Vulnerable, Migratory | Specially protected (migratory) | - | Species or species habitat may occur within area | None - BIA not found in EMBA |
| Shy albatross (*Thalassarche cauta)* | Endangered, Migratory | Vulnerable | - | Species or species habitat may occur within area | None - BIA not found in EMBA |
| Soft-plumaged petrel (*Pterodroma mollis)* | Vulnerable | - | - | Foraging, feeding or related behaviour likely to occur within area | None - BIA not found in EMBA |
| Southern giant petrel (*Macronectes giganteus)* | Endangered, Migratory | Specially protected (migratory) | - | Species or species habitat may occur within area | None - BIA not found in EMBA |
| Wandering albatross (*Diomedea exulans)* | Vulnerable, Migratory | Vulnerable | - | Species or species habitat may occur within area | None - BIA not found in EMBA |
| White-capped albatross (*Thalassarche steadi)* | Vulnerable, Migratory | Vulnerable | - | Species or species habitat may occur within area | None - BIA not found in EMBA |

### 8.2.1. Shorebirds

#### Asian Dowitcher

The Asian Dowitcher breeds in central and eastern Siberia, Mongolia and north-east China (DCCEEW 2024a). The main non-breeding areas are the east and south-east coasts of Sumatra. The estimates population size in Australia is 500. The Asian Dowitcher occupies sheltered coastal environments, such as embayments, coastal lagoons, estuaries and tidal creeks. They are known to frequent shallow water and exposed mudflats or sandflats. In Australia the Port Hedland Saltworks provides crucial habitat for the species. The species feeds on inter-tidal mudflats, this habitat is often vulnerable to pollution (e.g. oil spill, urban waste).

#### Australian Painted Snipe

The Australian painted snipe has been recorded at wetlands in all states of Australia (DoE 2014g). The Australian painted snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia or canegrass or sometimes tea-tree (*Melaleuca*). The Australian painted snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber (DoE 2014g).

#### Common Greenshank

The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia (Higgins & Davies 1996). It occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west. In Australia is has been recorded eating molluscs, crustaceans, insects, and occasionally fish and frogs. Elsewhere, it has also been recorded eating annelids, lizards, and rodents (Higgins & Davies 1996).

#### Curlew Sandpiper

This species is a migratory shorebird that breeds in north Siberia and spends the non-breeding season from western Africa to Australia (Bamford et al. 2008). The curlew sandpiper occurs around coastal Australia and preferred habitats include coastal brackish lagoons, tidal mud and sand flats, estuaries, saltmarshes and less often inland. Their diet is mainly comprised of polychaete worms, molluscs and crustaceans (Higgins & Davies 1996 in Garnet et al. 2011).

#### Eastern Curlew

The eastern curlew is a migratory shorebird that breeds in Siberia, Kamchatka and Mongolia and migrates to coastal East Asia and Australia. The South Korean Yellow Sea is an important staging post for this species. Non-breeding birds occur around coastal Australia, are more common in the north and have disappeared or become much rarer at many sites along the south coast (Garnet 2011).

Non-breeding birds are present at estuaries, mangroves, saltmarshes and intertidal flats, particularly those with extensive seagrass (Zosteraceae), where they feed on marine invertebrates, especially crabs and small molluscs (Higgins & Davies 1996 in Garnet 2011).

#### Greater Sand Plover and Lesser Sand Plover

The greater sand plover and lesser sand plover are congeners that breed in China, Mongolia and Russia. The greater sand plover spends the non-breeding season along coasts from Japan through southeast Asia to Australasia, while the lesser sand plover spends the non-breeding season along coasts from Taiwan to Australasia (Banford et al. 2008). Non-breeding birds occur along all Australian coasts, especially in the north for the greater sand plover and in the east for the lesser sand plover (DAWE 2020a).

#### Bar-tailed Godwit

Two subspecies of the bar-tailed godwit exist, as determined by their breeding locations in Siberia and Alaska (Bamford et al. 2008). Non-breeding birds migrate to the coasts of Australia. The northern Siberian subspecies occurs especially along the coasts of north Western Australia (DAWE 2020a).

Non-breeding birds are found on muddy coastlines, estuaries, inlets, mangrove-fringed lagoons and sheltered bays, feeding on annelids, bivalves and crustaceans (Higgins and Davies 1996 in Garnet et al. 2011).

### Red Knot

The red knot is a migratory shorebird, and the species includes five subspecies, including two found in Australia, *Calidris canutus piersmai* and *Calidris canutus rogersi*. The red knot breeds in Siberia and spends the non-breeding season in Australia and New Zealand. During the non-breeding season, the species spends the majority of its time on tidal mudflats or sandflats where they feed on intertidal invertebrates, especially shellfish (Garnet et al. 2011).

Non-breeding birds forage on beaches, saltmarshes, coastal bays and estuaries, and feed on marine invertebrates including molluscs, worms, crustaceans and insects (Marchant & Higgins 1993 in Garnet et al. 2011).

### Sharp-tailed Sandpiper

Most of the non-breeding population (~91% of EAAF population) migrates to Australia, with the species widespread in both inland and coastal locations and in both freshwater and saline habitats (DCCEEW 2024b). Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.

## 8.2.2. Seabirds

### Australian Lesser Noddy

This species is usually found only around its breeding islands in the Houtman Abrolhos Islands in Western Australia (Storr et al. 1986). The Australian lesser noddy occupies coral-limestone islands that are densely fringed with white mangrove *Avicennia marina*, and it occasionally occurs on shingle or sandy beaches (Higgins & Davies 1996 in DAWE 2020a). This species is thought to be sedentary or resident, staying near to its breeding islands in the non-breeding season. It may leave nesting islands for short periods during the non-breeding season, and probably forages widely (Higgins & Davies 1996 in DAWE 2020a).

Breeding apparently occurs only on Morley, Wooded and Pelsaert Islands at the Houtman Abrolhos Islands (Higgins and Davies 1996 in DoE 2014b). Mangrove stands support approximately 68,000 breeding pairs spread over the three islands (Surman & Nicholson 2006). Breeding may also occur on Ashmore Reef (Stokes & Hinchey 1990). The breeding season extends from mid-August to early April (Higgins & Davies 1996 in DoE 2014b).

The National Conservation Values Atlas identifies BIAs for this species in the area of the Houtman Abrolhos islands (**Table 16**). The Species Group Report Card – Seabirds (DSEWPaC 2012b) states that the entire Australian population of this species breeds in the South-west Marine Region, south of Busselton.

### Albatrosses

A Protected Matters search of the waters in the EMBA (Appendix D of the EP) identified several albatross species that may occur in the area, comprising of the northern royal albatross, Amsterdam albatross, Antipodean albatross, Tristan albatross, sooty albatross, wandering albatross, Indian yellow-nosed albatross, shy albatross, white-capped albatross, black-browed albatross and Campbell albatross. All these species predominantly occur in subantarctic to subtropical waters and breed on islands in the southern oceans (DAWE 2020a).

The National Conservation Values Atlas (DAWE 2020b) and the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC 2011) do not identify any BIAs for these species in the area from Busselton to the NT border. However, a BIA for the Indian yellow-nosed albatross is identified for foraging north to Shark bay and extending east into Bass Strait.

### Northern and Southern Giant Petrel

Giant petrels are highly migratory birds with a large natural range.

The Southern giant petrel occurs from Antarctic to subtropical waters and breeds on the Antarctic continent, peninsular and islands and on subantarctic islands and South America. Breeding occurs annually between August and March (DAWE 2020a).

The Northern Giant Petrel breeds in the sub-Antarctic, and visits areas off the Australian mainland mainly during the winter months (May-October) (DSEWPaC 2011).

### Soft-Plumaged Petrel

The soft-plumaged petrel is generally found over temperate and subantarctic waters in the South Atlantic, Southern Indian and western South Pacific Oceans. The species breeds colonially on islands in the southern oceans. Breeding occurs from August to May (Marchant & Higgins 1990 in DAWE 2020a).

A BIA for this species is identified for foraging in seas north to 21°30'S off WA.

### Abbott's Booby

Currently, Abbott's booby is only known to breed on Christmas Island and to forage in the waters surrounding the island and south-east Asia (TSSC 2020b). Within Christmas Island, most nests are found in the tall plateau forest on the central and western areas of the island, and in the upper terrace forest of the northern coast.

The National Conservation Values Atlas (DoEE 2019b) does not identify any BIAs for this species in the area spanning SW WA to the NT border. Critical habitat is considered all known nesting trees and all forest vegetation within a 200m radius of known nesting trees on Christmas Island (TSSC 2020).

### Australian Fairy Tern

The Australian fairy tern is distributed in a large geographic range between Australia, New Zealand and New Caledonia. Three subspecies have been identified, one of which is found in Australia. The Australian fairy tern occurs along the coasts of Victoria, Tasmania, South Australia and WA; occurring as far north as the Dampier Archipelago (DAWE 2020a). The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine islands, wetlands and mainland coastline (Higgins & Davies 1996 in DoE 2014b, Lindsey 1986).

Australian fairy terns nest on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The Australian fairy tern breeds from August to February depending on the location of the breeding colony (Higgins & Davies 1996 in DAWE 2020a). They generally nest in small colonies of up to 100 birds, although larger colonies of more than 1400 pairs have been reported in Western Australia (Hill et al. 1988).

The National Conservation Values Atlas (DAWE 2020b) identifies the vicinity of the lower north-west coast (north to Dampier Archipelago) and west coast (south to Peel inlet) as BIAs for foraging. Biologically important breeding areas were also identified scattered along the coast between Shark Bay and the Pilbara (Table 16).

### Christmas Island White-tailed Tropicbird

The Christmas Island white-tailed tropicbird is endemic to Christmas Island and leaves the island to forage in the warm waters of the Indian Ocean (Garnett 2011). The white-tailed tropicbird roots at sea; only incubating or brooding adults remain on nests on the island at night (Stokes 1988).

The National Conservation Values Atlas (DAWE 2020b) does not identify any BIAs for this species within the EMBA.

### Grey Falcon

The species occurs in arid and semi-arid Australia (TSSC 2020). The ecology of the Grey Falcon was known almost entirely from anecdotal and opportunistic observations but has been the subject of significant recent research. The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. While breeding Grey Falcons feed almost exclusively on birds.

### Indian Ocean Red-tailed Tropicbird

The Indian Ocean red-tailed tropicbird has a restricted area of occupancy of 94 km2 (DCCEEW 2023), as the subspecies only breeds on a small number of islands. The subspecies' preferred nest sites are rock crevices or under vegetation. The species is pelagic, feeding on fish and cephalopods, foraging by plunging into the water, or capturing flying fish in flight.

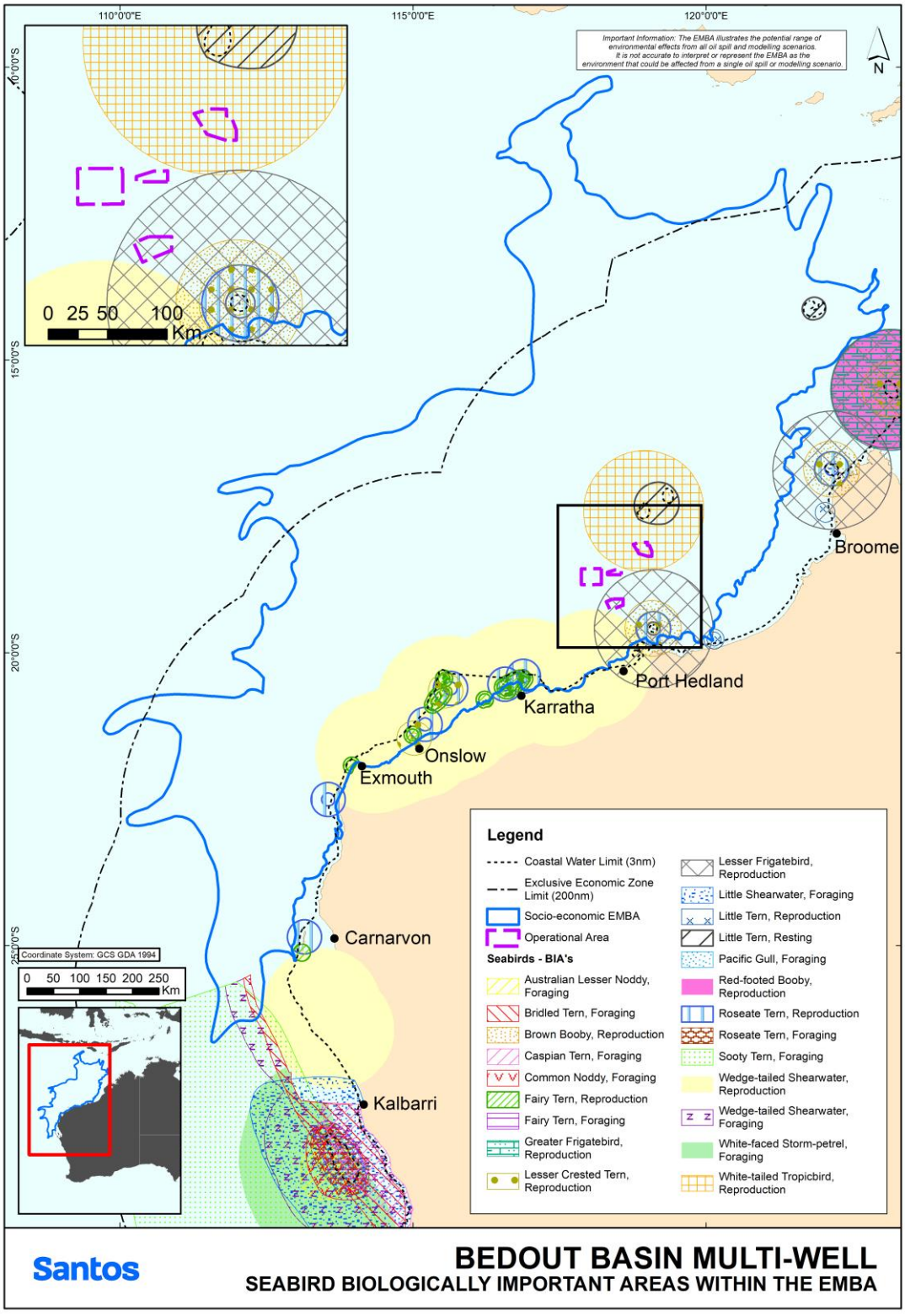



**Figure 13: Biologically Important Areas – Seabirds**

**Table 11: Summary of information for birds listed as threatened under the EPBC Act that may be in the EMBA**

| Species | Species Expected in EMBA | Breeding in the Area/ Seasonality | Foraging |
|---|---|---|---|
| **Shorebirds** | | | |
| Red knot[8] | Yes | No | Intertidal invertebrates |
| Curlew sandpiper[8] | Yes | No | Polychaete worms, molluscs and crustaceans taken from shorelines |
| Greater sand plover/lesser sand plover | Yes | No | Marine invertebrates taken from shorelines |
| Bar-tailed godwit | Yes | No | Annelids, bivalves and crustaceans taken from shorelines |
| Eastern curlew[8] | Yes | No | Marine invertebrates associated with seagrass |
| Australian painted snipe | Yes | No | Seeds and small invertebrates |
| Northern Siberian bar-tailed godwit | Yes | No | Worms, molluscs, crustaceans, insects and some plant material |
| **Seabirds** | | | |
| Australian lesser noddy | May forage from Kalbarri to Shark Bay | No | Small fish taken from marine and coastal waters (DoE 2014b) |
| Amsterdam albatross | Low densities | No | Cephalopods, fish and crustaceans taken from marine and coastal waters. |
| Black-browed albatross | Low densities | No | Cephalopods, fish and crustaceans taken from marine and coastal waters. |
| Campbell albatross | Low densities | No | Cephalopods, fish, salps, jellyfish and crustaceans taken from marine and coastal waters. |
| Indian yellow-nosed albatross | Low densities | No | Cephalopods, and fish taken from marine and coastal waters. |
| Shy albatross | Low densities | No | Cephalopods, fish and crustaceans taken from marine and coastal waters. |
| Wandering albatross | Low densities | No | Cephalopods, fish and crustaceans taken from marine and coastal waters. |
| White-capped albatross | Low densities | No | Cephalopods and fish taken from marine and coastal waters. |
| Southern & Northern giant petrel | Low densities | No | Scavenges penguin, seal and whale carcasses. Hunts live birds, penguin chicks' cephalopods and krill. Marine and coastal waters (DoE 2014b) |
| Soft-plumaged petrel | Low densities | No | Cephalopods, fish and crustaceans taken from marine and coastal waters (DoE 2014b) |
| Australian fairy tern | Yes | Yes<br>Aug to Feb | Bait fish taken from coastal waters |

| Species | Species Expected in EMBA | Breeding in the Area/ Seasonality | Foraging |
|---|---|---|---|
| Abbott's booby | Low densities | No | Fish and squid |
| Christmas Island white-tailed tropicbird | Very low densities | No | Squid and flying fish |

[8] Species listed under the East Asian-Australasian Flyway Partnership

## 8.3. Migratory Species

The EPBC PMST search identified an additional 36 species listed as migratory under the EPBC Act that may occur within the EMBA. These species are listed in Table 12. All of these species are also listed as migratory under the BC Act, with the exceptions of:

- the flesh-footed shearwater, which is listed as vulnerable under the BC Act.
- the red-tailed tropicbird which are listed as migratory under the EPBC Act and migratory and a Priority 4 under the BC Act.

Those species that are listed as both migratory and threatened under either the EPBC Act and/or BC Act are outlined in Table 10 and are not repeated within Table 12.

**Table 12: Summary of migratory birds that may occur within the EMBA**

| Species | Common Name | Likelihood of occurrence in EMBA |
|---|---|---|
| *Limosa lapponica* | Bar-tailed godwit | Species or species habitat known to occur within area |
| *Onychoprion anaethetus* | Bridled tern | Breeding known to occur within area |
| *Sula leucogaster* | Brown booby | Breeding known to occur within area |
| *Hydroprogne caspia* | Caspian tern | Breeding known to occur within area |
| *Anous stolidus* | Common noddy | Species or species habitat likely to occur within area |
| *Actitis hypoleucos* | Common sandpiper | Species or species habitat known to occur within area |
| *Ardenna carneipes* | Flesh-footed shearwater | Foraging, feeding or related behaviour likely to occur within area |
| *Apus pacificus* | Fork-tailed swift | Species or species habitat likely to occur within area |
| *Thalasseus bergii* | Greater crested tern | Breeding known to occur within area |
| *Fregata minor* | Greater frigatebird | Foraging, feeding or related behaviour likely to occur within area |
| *Fregata ariel* | Lesser frigatebird | Breeding known to occur within area |
| *Sternula albifrons* | Little tern | Breeding known to occur within area |
| *Sula dactylatra* | Masked booby | Breeding known to occur within area |
| *Charadrius veredus* | Oriental plover | Roosting known to occur within area |
| *Glareola maldivarum* | Oriental pratincole | Roosting known to occur within area |
| *Pandion haliaetus* | Osprey | Breeding known to occur within area |
| *Calidris melanotos* | Pectoral sandpiper | Species or species habitat known to occur within area |

| Species | Common Name | Likelihood of occurrence in EMBA |
|---|---|---|
| *Sula sula* | Red-footed booby | Breeding known to occur within area |
| *Cecropis daurica* | Red-rumped swallow | Species or species habitat may occur within area |
| *Phaethon rubricauda* | Red-tailed tropicbird | Breeding known to occur within area |
| *Sterna dougallii* | Roseate tern | Breeding known to occur within area |
| *Philomachus pugnax* | Ruff (reeve) | Roosting known to occur within area |
| *Calonectris leucomelas* | Streaked shearwater | Species or species habitat known to occur within area |
| *Ardenna pacifica* | Wedge-tailed shearwater | Breeding known to occur within area |
| *Phaethon lepturus* | White-tailed tropicbird | Breeding known to occur within area |

[8] Listed under the East Asian- Australasian Flyway Partnership

Australia is signatory to three international treaties with China, Japan and the Republic of Korea to safeguard migratory bird species, predominantly shorebirds. To facilitate observance of the three agreements, 36 species of migratory shorebirds have been listed as specially protected under both the Commonwealth EPBC Act and the WA BC Act.

Eleven internationally recognised areas that can support shorebird migrations are protected as wetlands of international importance. These wetlands are discussed further in Section 9.2.

The EPBC Act Policy Statement 3.21 sets out criteria for determining the significance of sites to migratory shorebirds based on the number of migratory species and the proportion of a species population that is supported by the site (Commonwealth of Australia 2017b). Site significance can be difficult to assess, particularly for ephemeral inland wetlands. These areas may be used rarely, depending on weather conditions, but still provide important habitat for migratory shorebird species.

Migratory shorebirds require a particular conservation approach due to their migration patterns that take them across international boundaries (Bamford et al. 2008). These species and their habitats are sensitive to threats due to their high site fidelity, tendency to aggregate, high energy demands and the need for habitat networks containing both roosting and foraging sites (Commonwealth of Australia 2017b). Migratory shorebirds are known to use networks of connected sites (also known as site complexes). They move within these networks depending on the time of day, availability of resources and environmental conditions at the site (Commonwealth of Australia 2017b).

The types of habitat used by migratory shorebirds in Australia vary across the species identified in the PMST search. Migratory shorebirds use both coastal and inland habitats that most commonly include:

- Coastal habitats: coastal wetlands, estuaries, mudflats, rocky inlets, reefs and sandy beaches, sometimes supporting mangroves.
- Inland habitats: inland wetlands, floodplains and grassland areas, often with ephemeral water sources (Commonwealth of Australia 2017b).

Feeding guilds provide an explanation for much of the shorebird distribution pattern in the north Western Australia. For example, Rogers (1999) classified shorebirds (and others) in Roebuck Bay as belonging to seven guilds on the basis of prey choice and foraging method. In order of abundance, these are summarised in Table 13.

**Table 13: Feeding guilds based on prey choice and foraging method (Rogers 1999) adapted from DEC (2003) and Bennelongia (2008)**

| Feeding habitat | Feeding guild | Species |
|---|---|---|
| Sea edge | Tactile hunters of macrobenthos | Red knot, bar-tailed godwit, Asian dowitcher |

| Feeding habitat | Feeding guild | Species |
|---|---|---|
| Along sandy sea edges or near tidal creeks | Tactile hunters of microbenthos | Curlew sandpiper, sharp-tailed sandpiper |
| Reefs or mangrove fringes | Visual hunters of slow surface-dwelling prey | Common sandpiper |
| Sandier western parts of Roebuck Bay, often near-shore | Visual hunters of small fast prey | Greater sand plover |
| Soft mudflats in north-east Roebuck Bay | Visual hunters of fast large prey | Eastern curlew, greenshank |

The Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015) provides a framework to guide the conservation of migratory shorebirds and their habitat in Australia and, in recognition of their migratory habits, outlines national activities to support their appreciation and conservation throughout the East Asian-Australasian Flyway.

The following migratory shorebird species are subject to the Wildlife Conservation Plan for Migratory Shorebirds 2015 (DoE 2015).

**Table 14: Birds subject to the Wildlife Conservation Plan for Migratory Shorebirds 2015**

| Migratory species | DCCEEW SPRAT information on distribution |
|---|---|
| Asian dowitcher[8] | The Asian dowitcher is a regular visitor to the north-west between Port Hedland and Broome. Elsewhere they are sporadic and rare. In the NT, the Asian dowitcher is found in Darwin and Arnhem Land. In WA, the species has been recorded at Albany, Lake McLarty, Lake McLeod, north-east Pilbara and the south-west Kimberley division. It has also been recorded at the Port Hedland Saltworks, Roebuck Bay, Ashmore Reed and Eighty Mile Beach. The Australian population is approximately 500 (Bamford et al. 2008). |
| Bar-tailed godwit | The bar-tailed godwit has been recorded in the coastal areas of all Australian states. In WA, it is widespread around the coast, from Eyre to Derby, with a few scattered records elsewhere in the Kimberley. In the NT populations have been recorded from Darwin and Melville Island. Sites of international importance from WA and the NT include:<br>• Eighty Mile Beach, WA (110,290 individuals)<br>• Roebuck Bay, WA (65,000 individuals)<br>• Milingimbi coast, NT (7,000 individuals)<br>• Elcho Island, NT (5,000 individuals). |
| Common greenshank | The common greenshank occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west. In the Kimberley region, it is recorded in the south-west and the north-east, with isolated records from the Bonaparte Archipelago. WA has three sites of international importance for the common greenshank which include:<br>• Eighty Mile Beach (2,240 individuals)<br>• Wilson Inlet (568 individuals)<br>• Roebuck Bay (560 individuals).<br>The NT does not have any sites of international importance. |
| Common sandpiper | WA distribution includes:<br>• Roebuck Bay<br>• Nuytsland Nature Reserve<br>• NT distribution includes:<br>• Kakadu National Park<br>• Darwin area. |
| Double-banded plover | The double-banded plover can be found in both coastal and inland areas. There are no nationally significant sites within WA. |
| Greater sand plover | In Australia, the greater sand plover occurs in coastal areas in all states, though the greatest numbers occur in northern Australia, especially the north-west. In northern Australia, the species is especially widespread between North West Cape and Roebuck Bay in Western Australia and are sparsely scattered records from the largely inaccessible area between Roebuck Bay and Darwin.<br>Internationally important sites within Western Australia include:<br>• Eighty Mile Beach (64,548 individuals)<br>• Roebuck Bay (26,900 individuals)<br>• Ashmore Reef (1,196 individuals). |
| Little ringed plover | Discrete populations around Perth (WA) and Darwin (NT). |
| Long-toed stint | In Western Australia, the species is found mainly along the coast, with a few scattered inland records. On the south coast the Long-toed Stint is found from Esperance to Albany and inland to Lake Cassencarry and Dumbleyung. On the south-west coast the species is known from the Vasse River estuary, Guraga Lake and the Namming Nature Reserve. The species has occasionally been recorded in the Gascoyne Region, around Lake Wooleen, Meeberrie Station and McNeill Claypan. It is widespread around the Pilbara region and the Kimberley Division between Karratha and Wyndham-Kununurra. Inland records include Lake Brown, Hannan Lake, Lake Biolet, Newman Sewage Farm and Lake Gregory. |
| Oriental plover | Internationally important marine sites:<br>• Eighty Mile Beach, WA (approximately 57 619 individuals)<br>• Roebuck Bay, WA (Approximately 8 750 individuals). |
| Oriental pratincole | Internationally important site:<br>• Eighty Mile Beach, WA (2.88 million birds).<br>The species occurs at numerous and widespread sites in northern Australia, especially near the Pilbara and Kimberley coasts of northern WA, and throughout the entire coastline of the NT. |
| Pectoral sandpiper | In Australasia, the pectoral sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.<br>The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. |
| Red knot[8] | The red knot large numbers are regularly recorded in north-west Australia, with 80 Mile Beach and Roebuck Bay being particular strongholds. The Australian population during the non-breeding period is estimated to be 135 000 (Hansen et al. 2016). |
| Ruff (reeve) | In Western Australia, the species has been recorded at the lower King River and it is mostly found in the south-west region of the state. It has been sighted at the Vasse River estuary, north to Namming Lake and Lake McLarty. It has been periodically recorded at Port Hedland, Kununurra and the Argyle Diamond Mine. There are unconfirmed reports at Curlewis Camp, Millstream Chichester, Broome and Roebuck Bay. |
| Sharp-tailed sandpiper | They are widespread from Cape Arid to Carnarvon, around coastal and subcoastal plains of Pilbara Region to south-west and east Kimberley Division (Higgins & Davies 1996).<br>Internationally important sites include:<br>• Eighty Mile Beach (25 000 individuals)<br>• Port Hedland Saltworks (20 000 individuals)<br>• Lake Gregory (10 000 individuals)<br>• Peel-Harvey system (4 030 individuals). |
| Wandering tattler | Discrete population in Darwin (NT). |
| Wood sandpiper | The wood sandpiper has its largest numbers recorded in north-west Australia, with all areas of national importance located in Western-Australia:<br>• Parry Floodplain (Wyndham) (355 individuals)<br>• Camballin (185 individuals)<br>• Lake Argyle (90 individuals)<br>• Shark Bay area, (80 individuals) |

| Migratory species | DCCEEW SPRAT information on distribution |
|---|---|
| | • Vasse-Wonnerup estuary (61 individuals)<br>• Lake McLarty (64 individuals)<br>• Kogolup Lakes (60 Individuals) |

[8] Listed under the East Asian-Australasian Flyway Partnership (EAAFP)

Shorebird migration patterns are seasonal and vary according to species (DSEWPaC 2012). Generally, shorebirds migrate to northern Australia in August to November. Many birds remain in northern Australia but others disperse southwards (Bennelongia 2011). Migratory shorebird numbers on northern beaches peak in November then again in March as the majority of birds begin their return to the northern hemisphere between March and May. Most migratory shorebirds do not breed in Australia and juvenile birds may spend several years in Australia before reaching maturity and returning north to breed (DEWHA 2009).

The Wildlife Conservation Plan for Migratory Seabirds (DoE 2020) seeks to facilitate a nationally coordinated effort to protect and conserve EPBC Act listed seabirds and provides an over-arching framework for their research and management, while encouraging an effort to address threats to seabirds and their habitats.

The following seabird species found within the EMBA are subject to the Wildlife Conservation Plan for Migratory Shorebirds 2020 (DoE 2020).

**Table 15: Birds (migratory) subject to the Wildlife Conservation Plan for Seabirds 2020**

| Migratory species | DCCEEW SPRAT information |
|---|---|
| Red-tailed tropicbird | The Australian population is poorly known owing to the numerous breeding sites and protracted and asynchronous breeding season making an accurate census difficult. The largest population breeds on Christmas Island (>2,000 pairs) with additional key breeding locations on Cocos (Keeling) Group, islands of Ashmore Reef Marine Park, Lord Howe Island, Norfolk Island, Coral Sea Marine Park and two known islands and cays in the Great Barrier Reef Marine Park. |
| White-tailed tropicbird | In Australia, the white-tailed tropicbird (Indian Ocean) breeds in the Cocos-Keeling Islands, at Ashmore Reef and Rowley Shoals off the northern coast of Western Australia. Over the past few years, birds have been sighted with increased frequency on West Island and Home Island (also in the main atoll) in the Cocos-Keeling Islands. The White-tailed Tropicbird (Indian Ocean) ranges widely over the oceans surrounding its breeding locations (Marchant & Higgins 1990).<br>The breeding population of the white-tailed tropicbird (Indian Ocean) in Australia is estimated at 120 birds. |
| Wedge-tailed shearwater | The wedge-tailed shearwater breeds on the east and west coasts of Australia and on off-shore islands. The species is common in the Indian Ocean, the Coral Sea and the Tasman Sea (Lindsey 1986). In Western Australia breeding occurs on islands off the west coast of WA including the Cocos-Keeling Island.<br>At WA breeding sites there are at least one million breeding pairs. |
| Flesh-footed shearwater | The flesh-footed shearwater is a locally common visitor to waters of the continental shelf and continental slope off south-western Western Australia to south-eastern Queensland and around Lord Howe Island.<br>Pairs breed on 41 islands off the coast of south-western Western Australia and Lord Howe Island in south-western Western Australia. Flesh-footed Shearwaters have been recorded as vagrants at Norfolk Island and are possibly regular visitors to Norfolk from breeding colonies on Lord Howe Island and around New Zealand (Moore 1985). |
| Streaked shearwater | The streaked shearwater undergoes trans-equatorial migration traveling south during winter, to the coasts of Vietnam, New Guinea, the Philippines, Australia, southern India and Sri Lanka.<br>The global population has been estimated to number 3 million individuals. |
| Lesser frigatebird | It has been suggested that lesser frigatebird roost at Weipa and survey data suggests Ashmore Reef Marine Park comprises significant numbers and is believed to account for ≥1% of the global population. |
| Great frigatebird | Important populations in Western Australian seas include those at North Keeling Island,the islands of Ashmore Reef Marine Park and Adele Island. |
| Masked booby | In Australia, the masked booby ranges from the Dampier Archipelago in Western Australia (WA), along the entire north coast and east coast to Brisbane. |

| Migratory species | DCCEEW SPRAT information |
|---|---|
| | Individuals regularly occur on islands off Australia, including Lord Howe, Norfolk, Kermadec and the Cocos-Keeling Islands.<br>The total Australian masked booby population is estimated to be between 3,750–4,270 breeding pairs. |
| Red-footed booby | This red-footed booby is found in tropical islands in most oceans, excluding the eastern Atlantic. It winters at sea in the same area, ranging north of the Tropic of Cancer and south of the Tropic of Capricorn. This species is largely pelagic occurring farther from land than other booby species.<br>The most important breeding population in Australia occurs in Pulu Keeling National Park in the Indian Ocean, which regularly supports more than 30,000 pairs. |
| Brown booby | In Australia, the brown booby is found from Bedout Island in Western Australia, around the coast of the Northern Territory to the Bunker Group of islands in Queensland with occasional reports further south in New South Wales (NSW) and Victoria. The species is reported further south to Tweed Heads, NSW, and to near Onslow, Western Australia and may be becoming more common in these areas.<br>Within Australian seas, including Christmas and Cocos-Keeling Islands in the eastern Indian Ocean, the total breeding population was 59 940–73 900 pairs in a 1996–97 survey. The global population estimate for the species is 200 000. |
| Common noddy | In Australia, the common noddy occurs mainly in ocean off the Queensland coast, but the species also occurs off the north-west and central Western Australia coast. The species is also rarely encountered off the coast of the Northern Territory, where only one breeding location with about 100-130 birds is known.<br>In 1996, the total Australian population of the Common Noddy was estimated to be between 174 480 and 214 130 breeding pairs. |
| Bridled tern | In Western Australia, bridled terns are breeding at Cape Leeuwin (extending round the southern coast to Seal Rocks) north to Shark Bay and in Pilbara region and Kimberley Division. At sea, distribution extends from Cape Leeuwin north to Dirk Hartog Island, with isolated mainland coastal records at Point Maud and Ningaloo, and from Barrow Island to the Dampier Archipelago, and at sea off the Kimberley coast from waters west of the Dampier Peninsula to Ashmore Reef and Joseph Bonaparte Gulf.<br>The total population in Western Australia is estimated to be at least 30 000–40 000 pairs and apparently increasing. |
| Little tern | The Australian breeding population can be divided into two major subpopulations (northern and eastern) with the northern subpopulation that breeds across northern Australia, from about Broome in north-western Western Australia through coastal Northern Territory to the Gulf of Carpentaria and eastern Cape York Peninsula. |
| Caspian tern | Within Western Australia, the Caspian tern is widespread in coastal regions, from the Great Australian Bight to the Dampier Peninsula. There are sparse records on the coasts east of King Sound and in eastern regions.<br>Breeding occurs from the Recherche Archipelago to Dirk Hartog Island and Faure Island in Shark Bay, and also in the Pilbara region from around Point Cloates to North Turtle Island, and more rarely, in the Kimberley. |
| Roseate tern | In Western Australia, the subspecies is regularly recorded north from Mandurah to around Eighty Mile Beach, in the Pilbara Region. Around the Kimberley coastline, the subspecies occurs at scattered sites, north to the Bonaparte Archipelago and possibly further. Records in south-west Western Australia indicate that the subspecies used to be a sporadic visitor to the region, but occurs regularly at present. In addition, breeding colonies have been established on Lancelin Island and Second Rock, off Western Australia (Higgins & Davies 1996).<br>In the Northern Territory, the subspecies has a scattered occurrence along the north coast, mainly from Darwin to Gove Peninsula, though birds have been recorded west to North Peron |

| Migratory species | DCCEEW SPRAT information |
|---|---|
| | Island and east to the Sir Edward Pellow Islands (Chatto 2001). The subspecies is more widespread in the west and south-west of the Gulf of Carpentaria (Higgins & Davies 1996).I |
| Osprey | The breeding range of the eastern osprey around the northern coast of Australia (including many offshore islands) extends from Albany in Western Australia to Lake Macquarie in NSW; with a second isolated breeding population on the coast of South Australia. The species is most abundant in northern Australia, where high population densities occur in remote areas. A population on Barrow Island was estimated at 20 pairs in 1978. |

Like many birds, seabirds often migrate after the breeding season. Of these, the migration taken by the Arctic tern (*Sterna paradisaea*) is the farthest of any bird, crossing the equator in order to spend the Austral summer in Antarctica (Egevang et al. 2010; Fijim et al. 2013). Other species also undertake trans-equatorial trips, both from the north to the south, and from south to north (DoE 2020).

Other species migrate shorter distances away from the breeding sites, their distribution at sea determined by the availability of food. If oceanic conditions are unsuitable, seabirds will immigrate to more productive areas, sometimes permanently if the bird is young (Oro et al. 2004). After fledging, juvenile birds often disperse further than adults, and to different areas, so are commonly sighted far from a species' normal range. Some species, such as some of the storm petrels, diving petrels and cormorants, rarely disperse at all, staying near their breeding colonies year-round (DoE 2020).

## 8.4. Biologically Important Areas / Critical Habitat– Birds

Table 16 below provides an overview of BIAs in the EMBA for birds. The DCCEEW may make recovery plans for threated fauna listed under the EPBC Act. The EPBC Act requires that 'habitat critical to the survival of the listed threatened species' is identified in recovery plans, relevant recovery plans are listed in Section 13.2[4].

In addition, both the EPBC Act and WA BC Act and associated regulations (2018) provide for the listing of critical habitat - habitat 'critical to the survival of the threatened species. No provision is made under the TPWC Act for listing critical habitat.

[4] Further background information on BIA and identification of critical habitat in recovery plans is provided in Section 5.4.

**Table 16: Critical habitat/ biologically important areas - birds**

| Species | Scientific name | Aggregation area and use | Specific geographic locations for species |
|---|---|---|---|
| Australian fairy tern | *Sternula nereis* | Foraging – lower north-west coast, west coast, south coast including islands.<br>Reproduction – Pilbara and Gascoyne coasts and islands | Found in the vicinity of lower north-west coast (north to Dampier Archipelago), west coast (south to Peel Inlet) and south coast (from Flinders Bay east to Israelite Bay), including islands (as far offshore as Trimouille Island and Houtman Abrolhos).<br>Pilbara and Gascoyne coasts and islands |
| Bridled tern | *Onychoprion anaethetus* | Foraging - West coast of Western Australia and around to Recherche Archipelago | West coast of WA and around to Recherche Archipelago including offshore waters |
| Brown booby | *Sula leucogaster* | Reproduction, foraging - Kimberley and northern Pilbara coasts and islands also Ashmore Reef. | Kimberley and northern Pilbara coasts and islands also Ashmore Reef. |
| Greater frigatebird | *Fregata minor* | Reproduction, foraging - Kimberley and Ashmore Reef | Kimberley and Ashmore Reef |
| Lesser crested tern | *Sterna bengalensis* | Reproduction, foraging - Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef | Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef |
| Lesser frigatebird | *Fregata ariel* | Reproduction, foraging – Kimberley and Pilbara coasts and islands also Ashmore Reef. | Kimberley and Pilbara coasts and islands also Ashmore Reef. |
| Little tern | *Sternula albifrons* | Reproduction, foraging, resting - Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef<br>Resting - Roebuck Bay | Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef<br>Roebuck Bay Ramsar site |
| Roseate tern | *Sterna dougallii* | Reproduction, foraging – Islands and coastline in the Kimberley, Pilbara and Gascoyne regions<br>Resting – Eighty Mile Beach<br>Foraging & provisioning young– North-western and west coasts and islands from Sir Graham Moore Is (13º50'S), south to Mandurah (32º32'S) and as far offshore as Ashmore Reef, Bedout Island and the Houtman Abrolhos. | Eighty Mile Beach (northern end)<br>Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef<br>Low Rocks and Stern Island in Admiralty Gulf<br>North-east and North-west Twin Islets near the mouth of King sound<br>North-western and west coasts and islands from Sir Graham Moore Is (13º50'S), south to Mandurah (32º32'S) and as far offshore as Ashmore Reef, Bedout Island and the Houtman Abrolhos. |
| Sooty tern | Onychoprion fuscata (previously *Sterna fuscata)* | Foraging – Timor Sea | Timor Sea S to 14º30, off northwest coast from Lacepede I SW to 117ºE including Abrolhos, Fisherman & Lancelin Is, accidental on lower west coast to Hamelin Bay. Breeding visitor (late Aug - early May) Abrolhos & Lancelin Is; casual winter (Nov - Apr) to Fisherman |
| Wedge-tailed shearwater | *Ardenna pacifica* | Reproduction, foraging – west coast from Ashmore Reef to Carnac I. Kimberley, Pilbara, Gascoyne coasts, Ashmore reef | Reproduction (in hundreds of thousands) off west coast from Ashmore Reef (12º15'S) to Carnac Island (32º07'S), and ranging in western seas between 12º00'S and 33º20'S.<br>Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef |
| White-tailed tropic bird | *Phaethon lepturus* | Breeding, foraging - Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef | Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef |

# 9. Protected Areas

A number of areas in the EMBA are protected under state and federal legislation. Protected areas include World Heritage Areas, Wetlands of National Importance, National and Commonwealth Heritage Places, and terrestrial conservation reserves (National Parks, Nature Reserves and Conservation Parks) that bound marine waters. These areas are listed in Table 17, and shown in Figure 15 and Figure 16.and discussed below. Other protected areas include Key Ecological Features (discussed in Section 10) and State and Commonwealth Marine Parks/Reserves (discussed in Section 11 and Section 12). A Protected Matters search of the EMBA (Appendix D of the EP) identified several protected areas which were deemed to be irrelevant to Santos' petroleum activities due to their terrestrial location (e.g. Forrestdale and Thomsons Lakes – Ramsar wetland).

The Register of the National Estate (RNE) provides a listing of more than 13,000 natural, historic and indigenous sites of significance. However, in 2012 all references to the RNE were removed from the EPBC Act and the *Australian Heritage Council Act 2003*.The RNE is now maintained on a non-statutory basis as a publicly available archive and educational resource. The RNE places are not discussed further here but are listed in Appendix A.

**Table 17: Summary of protected areas in waters within the EMBA**

| Area type | Title |
|---|---|
| World Heritage Area | Shark Bay |
| | The Ningaloo Coast |
| Wetlands of National Importance | Mermaid Reef |
| | Eighty Mile Beach System |
| | Exmouth Gulf East |
| | Leslie (Port Hedland) Saltfields System |
| | Cape Range Subterranean Waterways |
| National Heritage Place | Dampier Archipelago (including Burrup Peninsula) (Indigenous) |
| | The Ningaloo Coast (Natural) |
| | Shark Bay (Natural) |
| Commonwealth Heritage Place | Scott Reef and Surrounds – Commonwealth Area |
| | Ningaloo Marine Area - Commonwealth Waters |
| | Mermaid Reef - Rowley Shoals |
| | Learmonth Air Weapons Range Facility |
| Terrestrial Conservation Reserves e.g. national parks, nature reserves, and conservation parks. | Numerous bounding marine waters – refer to Section 9.5. |

## 9.1. World Heritage Areas

There are threee World Heritage Areas (WHA) that occur within the EMBA: the Ningaloo Coast, Shark Bay and the Murujuga Cultural Landscape.

### 9.1.1. Shark Bay

Shark Bay was included on the World Heritage List in 1991 and is one of the few properties inscribed for all four outstanding natural universal values:

- An outstanding example representing the major stages in the earth's evolutionary history
- An outstanding example representing significant ongoing ecological and biological processes
- An example of superlative natural phenomena
- Containing important and significant habitats for in situ conservation of biological diversity.

Since 1997, an agreement established the joint management of the Shark Bay WHA by the Australian Commonwealth government and the Western Australian state government, with the operational responsibility by the Western Australian agencies (DEWHA 2008a). This agreement also created a Community Consultative Committee and a Scientific Advisory Committee, both of which provide advice as required. The entire WHA encompasses islands and peninsulas, with an area of approximately 2.2 million ha (70 % of which is marine waters), and includes the following areas (UNESCO 2020):

- Hamelin Pool Marine Nature Reserve
- Francois Peron National Park
- Shell Beach Conservation Park
- Monkey Mia Reserve
- Monkey Mia Conservation Park
- Zuytdorp Nature Reserve
- Bernier, Dorre and Koks Islands Nature Reserves
- Dirk Hartog Island National Park
- Various pastoral leases.

The marine environment of the Shark Bay World Heritage Area is protected as a State Marine Reserve and is discussed further in Section 9.1.1

### 9.1.2. The Ningaloo Coast

The Ningaloo Coast was included on the World Heritage List in 2011 and was inscribed for outstanding natural universal values as follows:

- An example of superlative natural phenomena and areas of exceptional natural beauty and aesthetic importance
- outstanding examples representing major stages of Earth’s history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.
- 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.

The Ningaloo Coast WHA includes (DEWHA 2010b):

- Ningaloo Marine Park (Commonwealth waters)
- Ningaloo Marine Park (Western Australia state waters)
- Muiron Island Marine Management Area (including the Muiron Islands)
- Jurabi Coastal Park
- Bundegi Coastal Park
- Cape Range National Park

- Learmonth Air Weapons Range.

The Ningaloo Coast World Heritage Area (including the Muiron Islands) is managed under a plan that is consistent with the World Heritage Convention and Australia's World Heritage management principles. World Heritage Management principles are set out in regulations and cover matters relevant to the preparation of management plans, the environmental assessment of actions that may affect the property and community consultation processes.

The Australian World Heritage management principles are outlined under Schedule 5 of the EPBC regulations (2000). The objective is to ensure that any likely impact of an action on the World Heritage values of the property should be considered. Any action should be consistent with the protection, conservation, presentation or transmission to future generations of the World Heritage values of the property.

The marine environment of the Ningaloo Coast World Heritage Area is protected as a State Marine Park, a Commonwealth Marine Park, and is discussed further in Section 11.1.1 and Section 12.3.3, respectively.

### 9.1.3. Murujuga Cultural Landscape

The Murujuga Cultural Landscape was included on the World Heritage List in 2025 and is described as an outstanding example of a continuing cultural landscape.

Murujuga Cultural Landscape is situated in the Pilbara region of Western Australia and holds deep cultural importance for First Nations communities. Traditionally the homeland of the Yaburara people, Murujuga is now cared for by five language groups: Yaburara, Ngarluma, Yindjibarndi, Mardudhunera, and Wong-Goo-Tt-Oo. These groups collectively identify as Ngarda-Ngarli, the Traditional Owners and Custodians of the area.

Murujuga spans approximately 100,000 hectares, comprising 42 islands, islets, and rocky formations ranging in size from 2 to 3,290 hectares. It is renowned for its extraordinary concentration of petroglyphs—rock carvings estimated to number between 1 and 2 million, making it one of the most significant sites of its kind globally.

These petroglyphs serve as a visual archive of over 50,000 years of cultural expression. They depict:

- social and life sustaining activities
- ceremonies and rituals
- animals and plants
- complex spiritual beliefs and social systems.

The petroglyphs also represent:

- movement of ancestral creation spirits
- interaction between generations of ancestors and the landscape
- the connection between First Nations People and their history, identity and sacred beliefs.

The Murujuga Cultural Landscape, otherwise known as the Dampier Archipelago, is also included on the National Heritage List.

## 9.2. Wetlands of National Importance

### 9.2.1. Mermaid Reef

See the Mermaid Reef Marine Park (Section 12.3.8).

### 9.2.2. Eighty Mile Beach System

See Eighty Mile Beach Ramsar site (Section 9.2.2).

### 9.2.3. Exmouth Gulf East

The Exmouth Gulf East wetlands are located in the eastern section of Exmouth Gulf from Giralia Bay to Urala Creek Locker Point. The wetland comprises of numerous tidal creeks, indentations and islands of dry land, mudflats, saline coastal flats and extensive mangroves (DAWE 2020a).

The site is one of the major population centres for dugongs in WA and its seagrass beds and extensive mangroves provide nursery and feeding areas for marine fishes and crustaceans in the Gulf. In addition, there are at least 29 species of birds which utilise the wetland, including 16 migratory shorebirds and several terns (DAWE 2020a).

#### 9.2.4. Leslie (Port Hedland) Saltfields System

The Leslie (Port Hedland) Saltfields System (13,000 ha) comprises a large saltfield, fringing coastal flats, tidal creeks and mudflats between the saltfields and the Indian Ocean.

The wetland is likely a major migration stop-over area for shorebirds in the East Asia-Australasia Flyway. It is an important site for oriental plover (*Charadrius veredus*). It is also likely to be the most important site in Australia for Asian dowitcher (*Limnodromus semipalmatus*) (DAWE 2020f).

#### 9.2.5. Cape Range Subterranean Waterways

The Cape Range Subterranean Waterways wetland site comprises of the subterranean waterways, sinkholes, general groundwater and artificial wells of the coastal plain and foothills of Cape Range north of a line between Norwegian Bay, at the foot of the peninsula on the west coast, and the Bay of Rest in Exmouth Gulf (DAWE 2020l).

The site is one of the only examples of subterranean karst wetland system (apart from Barrow Island) in arid north-western Australia. Two threatened species have been identified within the wetland and include the blind cave eel and the blind gudgeon (DAWE 2020l).

## 9.3. National Heritage Places

Natural, historic and indigenous places that are of outstanding heritage value to the Australian nation are recorded as National Heritage Places. Eleven National Heritage Places are found in waters from the South Australian border to the NT, with ten of these occurring within the EMBA. Kakadu National Park, Shark Bay and The Ningaloo Coast are listed as both World Heritage Areas and National Heritage Places and are discussed in **Section 9.1**.

#### 9.3.1. The Ningaloo Coast

See the Ningaloo Coast World Heritage Area (Section 9.1.2).

#### 9.3.2. Shark Bay

See Shark Bay World Heritage Area (Section 9.1.1).

#### 9.3.3. Dampier Archipelago (including Burrup Peninsula)

The Dampier Archipelago (including the Burrup Peninsula) contains one of the densest concentrations of rock engravings in Australia, with some sites containing thousands or tens of thousands of images. At a national level it has an exceptionally diverse and dynamic range of schematised human figures and provides an unusual and outstanding visual record of the Aboriginal responses to the rise of sea levels at the end of the last Ice Age (DoEE 2019c).

The site is about 36,860 ha at Dampier and comprises of nine distinct areas of the Burrup Peninsula Areas and part of the following surrounding islands: West Intercourse Island, West Mid Intercourse Island, Enderby Island, Goodwin Island, West Lewis Island and East Lewis Island, Rosemary Island, Brigadier Island, Miller Rocks, Lady Nora Island and Elphick Nob, Malus Islands, Angel Island, Gidley Island, Cohen Island, Keast Island and Collier Rocks, Tozer Island, Dolphin Island, and Unnamed Island (DoEE 2019c).

## 9.4. Commonwealth Heritage Places

The Commonwealth Heritage Places List comprises natural, indigenous and historic heritage places which are either entirely within a Commonwealth area, or outside the Australian jurisdiction and owned or leased by the Commonwealth or a Commonwealth Authority. Ten Commonwealth Heritage Places are found in or adjacent to the EMBA. Two of these places (Ashmore Mermaid Reef and the Ningaloo Marine Area – Commonwealth Waters) are found in Marine Parks and are discussed further in Section 12.

### 9.4.1. Scott Reef and Surrounds – Commonwealth Area

Scott Reef is a large, emergent shelf atoll located on the edge of the broad continental shelf, about 300 km from mainland north-western Australia. The listing comprises the areas of Scott Reef that are within Commonwealth waters to the 50 m BSL bathymetric contour. This includes North Reef, an annular reef, 16.3 km long and 14.4 km wide and parts of the lagoon of South Reef, a crescent shaped reef 17 km across (DoE 2014d).

The place is regionally significant both because of its high representation of species not found in coastal waters off Western Australia and for the unusual nature of its fauna which has affinities with the oceanic reef habitats of the Indo-West Pacific as well as the reefs of the Indonesian region (DoE 2014d).

### 9.4.2. Mermaid Reef – Rowley Shoals

See the Mermaid Reef Marine Park (**Section 12.3.8**).

### 9.4.3. Ningaloo Marine Area – Commonwealth Waters

See the Ningaloo Coast World Heritage Area (**Section 9.1.2**).

### 9.4.4. Learmonth Air Weapons Range Facility

The Learmonth Air Weapons Range Facility is located 30 km south west of Learmonth within Cape Range and Adjacent Coastal Plain, which is listed on the Register of the National Estate. As the Learmonth Air Weapons Range Facility is located within Cape Range it is of considerable importance of showing the sea level and landform changes for the past 1.8 million years (DoEE 2019h).

The area is important to a number of cave fauna of Cape Range and is considered of exceptional biogeographical importance. It hosts a high number of endemic aquatic stygofauna with ecosystems found within this area are considered rare within Western Australia and are considered to be of considerable scientific interest. The area also supports several species of terrestrial fauna that are isolated populations, populations at the extent of their range and a number of fauna and flora species that are endemic to southern WA and restricted to sandy coastal habitats along the western coast (DoEE 2019h).

## 9.5. Coastal Terrestrial Conservations Reserves – bound by marine waters

Conservation reserves are created under the Land Administration Act 1997, and once reserved and set aside for conservation purposes are regulated under the *Conservation and Land Management Act (CALM) 1984*. Most conservation reserves in WA are vested in (owned) by the WA Conservation and Parks Commission, an independent statutory body established by the CALM Act 1984, and most are managed by the Department of Biodiversity, Conservation and Attractions – Parks and Wildlife Service

In WA there are three main types of terrestrial conservation reserves with legislative protection:

- Nature reserves – established for wildlife and landscape conservation; scientific study; and preservation of features of archaeological, historic or scientific interest.
- National parks – as above but also to be used for enjoyment by the public. Have national or international significance.
- Conservation parks – as above but have local or regional significance.

Nature reserves can have an extra classification applied to them and become ‘A class’ reserves, which generally require an Act of Parliament to alter.

There are numerous terrestrial conservation reserves located adjacent to the coast in the EMBA. The oceanward boundary of the reserves varies. In some cases, the reserves extend to the low water mark, i.e. including the inter-tidal zone (particularly applicable to older gazetted reserves and terrestrial reserves not surrounded by a marine reserve). While in other cases, the terrestrial reserves extend to the high-water mark e.g. Lowendal Islands Nature Reserve (particularly applicable to terrestrial reserves adjacent to more recently gazetted marine parks). In other cases, the seaward boundary of the reserves is not defined. Management plans also contain the caveat for further consideration of the most appropriate tenure for intertidal areas and management arrangements.

Further information on coastal terrestrial reserves is provided below in **Section 9.5.1** (national parks) and **Section 9.5.2** (nature reserves and conservations parks).

### 9.5.1. Coastal National Parks

Protected coastal national parks managed under the CALM Act 1984 in the EMBA are listed in **Table 18**. The table also includes: any applicable management plan; whether the park includes the inter-tidal area; and the name of any adjacent state marine reserve. All WA National Parks are WA Class A reserves and IUCN Class 2.

**Table 18: Coastal National Parks – coastal boundary in relation to inter-tidal zone**

| National Park | IBRA bioregion[5] | Management plan | Includes inter-tidal zone | Adjacent Marine Management Park (see Section 11) |
|---|---|---|---|---|
| **Reserves of North-West WA** | | | | |
| Murujuga | Pilbara | Murujuga National Park management plan 78 (DEC 2013) | Yes | - |
| Cape Range | Carnarvon | Cape Range National Park Management Plan (DEC 2010a) | No | Ningaloo Marine Park |
| Nyinggulara | Carnarvon | Nyinggulu (Ningaloo) Coastal Reserves Joint Management Plan (DBCA 2022b) | No | Ningaloo Marine Park |
| **Reserves of Southern WA** | | | | |
| Houtman Abrolhos Islands | Geraldton Sandplains | Houtman Abrolhos Islands National Park Management Plan 97 2022 (DBCA 2022) | No - extends to the high-water mark only. | Abrolhos Commonwealth Marine Park |

### 9.5.2. Coastal Nature Reserves and Conservation Parks

Protected coastal nature reserves and conservation parks managed under the CALM Act 1984 in the EMBA are listed in **Table 19**. The table also includes reserve class; IUCN classification; any applicable management plan; whether the reserve includes the inter-tidal area; and the name of any adjacent state marine reserve (may also describe inter-tidal areas values).

The CALM Act does not require management plans to be in place for conservation reserves at all times, instead they are required to be made as is reasonably practicable regarding resources. This means some conservation reserves do not have a management plan, or do not have a recent management plan.

[5] IBRA classifies Australia's landscapes into large geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information (DoEE 2012).

**Table 19: Nature Reserves (NR), Conservation Parks (CP), Regional Parks (RP) and Coastal Reserves (CR) in the EMBA**

| Reserve name and type | Reserve class | IUCN | Management Plan | Includes inter-tidal zone | Adjacent Marine Park (see Section 11) |
|---|---|---|---|---|---|
| **Reserves of northern WA** | | | | | |
| Jarrkunpungu NR | A | - | Parks and reserves of the south-west Kimberley and north-west Pilbara Joint Management Plan (DBCA 2019b). *Covers 80 Mile Beach coastal reserves* | No | Eighty Mile Beach Marine Park |
| Unnamed | A | - | | | |
| Bedout Island NR | A | 1a | - | Yes | - |
| **Reserves of north-west WA** | | | | | |
| Unnamed (Dampier Archipelago) NR | A | 1a | Dampier Archipelago Management Plan (CALM 1990). *Covers 25 of the islands* | Yes | - |
| Unnamed NR | | 1a | - | Yes | - |
| North Sandy Island NR | A | 1a | - | Yes | - |
| Montebello Islands CP | A | 2 | - | Partially | Montebello Islands Marine Park |
| Lowendal Island NR | | 1a | - | No | Barrow Island Marine Management Area and Marine Park. Lowendal Island NR only partially bounded |
| Barrow Island NR | A | 1a | Barrow Island Group Nature Reserves (DPAW 2015) | Yes | |
| Boodie, Double and Middle Islands NR | - | 1a | | Yes | |
| Great Sandy Island NR | B | 1a | - | Yes | Barrow Island Marine Management Area |
| Little Rocky Island NR | A | 1a | - | Yes | - |
| Airlie Island NR | - | 1a | - | Yes | - |
| Thevenard Island Nature | - | 1a | - | Yes | - |
| Bessieres Island NR | A | 1a | - | Yes | - |
| Serrurier Island NR | - | 1a | - | Yes | - |
| Round Island NR | - | 1a | - | Yes | - |
| Locker Island NR | A | 1a | - | Yes | - |
| Rocky Island NR | - | 1a | - | Yes | - |
| Victor Island NR | - | 1a | - | Yes | - |
| Y Island NR | - | 1a | - | Yes | - |
| Muiron Islands NR | - | 1a | Jarabi and Bundegi Coastal Parks and Muiron Islands (CALM 1999) | No | Muiron Islands Marine Management Area |
| Nyinggulu CR | - | - | Nyinggulu (Ningaloo) Coastal Reserves Joint Management Plan (DBCA 2022b) | No | Ningaloo Marine Park |

## 9.6. Threatened Ecological Communities

An ecological community is a naturally occurring group of plants, animals and other organisms interacting in a unique habitat. Ecological communities are listed under the EPBC Act as threatened if the community is at risk of extinction.

Similarly, ecological communities can be listed under the WA BC Act as threatened if facing a risk of becoming a collapsed ecological community. To date no ecological communities are listed as threatened under the WA Act, however several ecological communities are currently endorsed by the WA Minister of Environment as Threatened Ecological Communities (TECs) through the previous non-statutory process.

# 10. Key Ecological Features

## 10.1. Introduction

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. KEFs meet one or more of the following criteria (DSEWPaC 2012a):

- A species, group of species or a community with a regionally important ecological role
- A species, group of species or a community that is nationally or regionally important for biodiversity
- An area or habitat that is nationally or regionally important for:
  - Enhanced or high biological productivity
  - Aggregations of marine life; or
  - Biodiversity and/or endemism
- A unique sea floor feature with ecological properties of regional significance.

Ten key ecological features of the Commonwealth waters in the EMBA (covering the NMR, the NWMR and the SWMR) have been identified in the protected matters search (**Figure 14**) and are discussed in this section. **Sections 1** and **2** provide an overview of the geomorphology and oceanography of the Indian Ocean. Individual EPs will describe specific ecological features outside of the Commonwealth waters that are within that activity's EMBA.

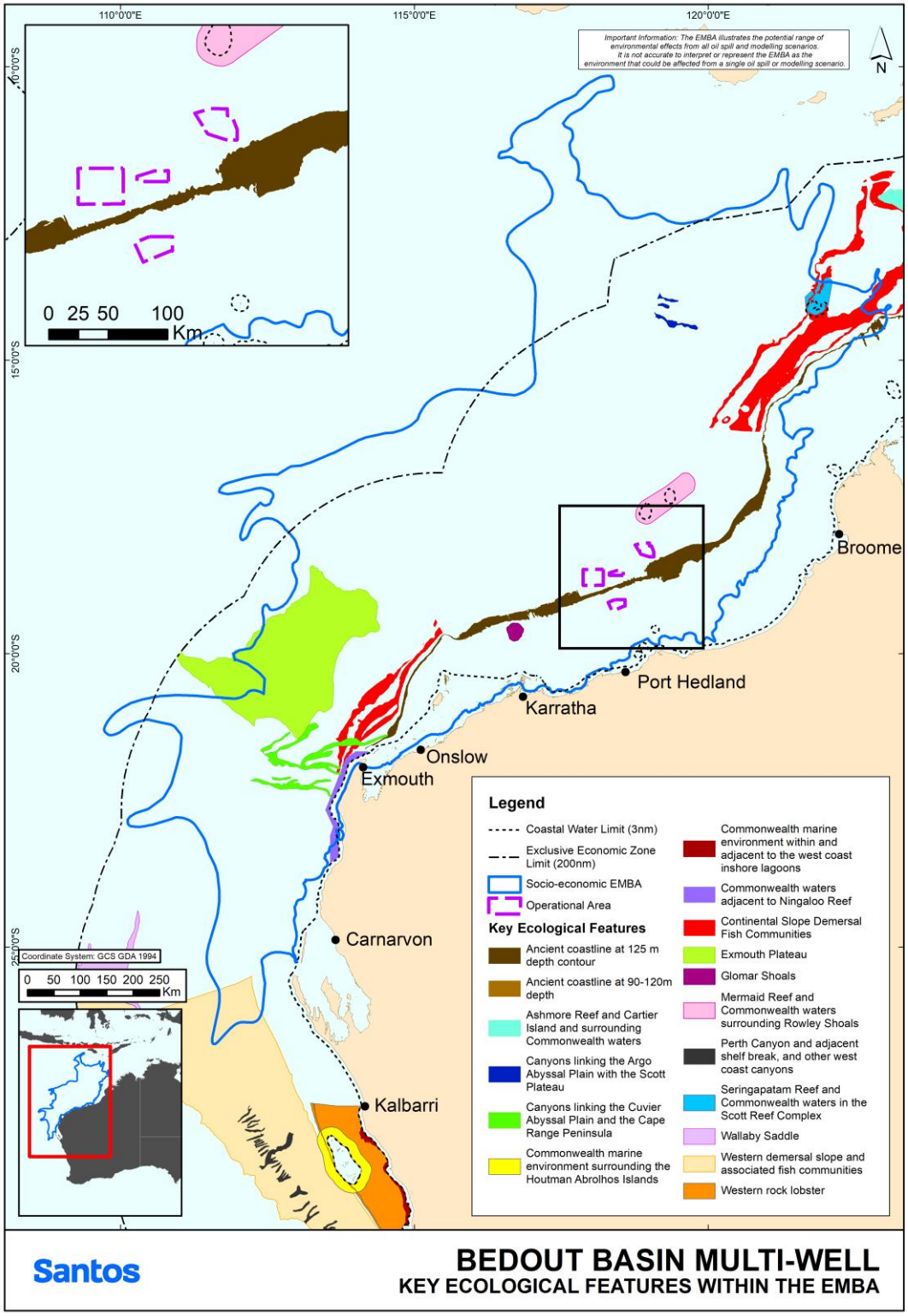



**Figure 14: Key ecological features in the EMBA**

### 10.1.1. Western Demersal Slope and associated Fish Communities

The Western Demersal Slope and associated Fish Communities, also known as the Demersal Slope and associated Fish Communities of the Central Western Province, is defined as a key ecological community for its high levels of biodiversity and endemism. It is located on the edge of the shelf to the limit of the exclusive economic zone from Perth to the northern boundary of the SWMR. The western demersal slope provides important habitat for demersal fish communities, with a high level of diversity and endemism. A diverse assemblage of demersal fish species below a depth of 400 m is dominated by relatively small benthic species such as grenadiers, dogfish and cucumber fish. Unlike other slope fish communities in Australia, many of these species display unique physical adaptations to feed on the sea floor (such as a mouth position adapted to bottom feeding), and many do not appear to migrate vertically in their daily feeding habits (DSEWPaC 2012a, Williams et al. 2001). A total of 480 fish species have been described that inhabit the slope of this bioregion with 31 considered to be endemic to the bioregion (DoEE 2019a). Demersal fish communities within the area have recorded higher diversity when compared to other oceanic regions which have been more intensively sampled. The increased diversity within the area has been attributed to the overlap of ancient and extensive Indo-west Pacific and temperate Australasian fauna (Williams et al. 2001).

This KEF is located partially within the EMBA.

### 10.1.2. Commonwealth Waters Adjacent to Ningaloo Reef

The Commonwealth Waters adjacent to Ningaloo Reef KEF is defined for high productivity and aggregations of marine life. The Ningaloo Reef extends almost 300 km along the Cape Range Peninsula to the Red Bluff and is globally significant as the only extensive coral reef in the world that fringes the west coast of a continent. Commonwealth waters adjacent to the reef are thought to support the rich aggregations of marine species at Ningaloo Reef through upwellings associated with canyons on the adjacent continental slope and interactions between the Ningaloo and Leeuwin currents (Brewer et al. 2007, DEWHA 2008d, DSEWPaC 2012a). The narrow continental shelf (10 km at its narrowest) means that the nutrients channelled to the surface via canyons are immediately available to reef species. Terrestrial nutrient input is low; hence this deep-water source is a major source of nutrients for Ningaloo Reef and therefore very important in maintaining this system (DEWHA 2008c).

The reef is known to support an extremely abundant array of marine species including over 200 species of coral and more than 460 species of reef fish, as well as molluscs, crustaceans and other reef plants and animals (DEWHA 2008c). Marine turtles, dugongs and dolphins frequently visit the reef lagoon. The Commonwealth waters around Ningaloo include areas of potentially high and unique sponge biodiversity (DEWHA 2008c). Upwellings on the seaward side support aggregations such as whale sharks and manta rays (these waters are the main known aggregation area for whale sharks in Australian waters). Humpback whales are seasonal visitors to the outer reef edge and seasnakes, sharks, large predatory fish and seabirds also utilise the reef and surrounding waters.

This KEF is located partially within the EMBA.

The Ningaloo Marine Park includes this Key Ecological Feature and is discussed in **Section 12.3.3**.

### 10.1.3. Canyons Linking the Cuvier Abyssal Plain with the Cape Range Peninsula

The Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula are defined as a KEF as they are unique sea floor features with ecological properties of regional significance.

Cape Range Peninsula and the Cuvier Abyssal Plain are linked by canyons, the largest of which are the Cape Range Canyon and Cloates Canyon. These two canyons are located along the southerly edge of Exmouth Plateau adjacent to Ningaloo Reef and are unique due to their close proximity to the North West Cape (DSEWPaC 2012a). The Leeuwin Current interacts with the heads of the canyons to produce eddies resulting in delivery of higher nutrient, cool waters from the Antarctic intermediate water mass to the shelf (Brewer et al. 2007). Strong internal tides also create upwelling at the canyon heads (Brewer et al. 2007). Thus, the canyons, the Exmouth Plateau and the Commonwealth waters adjacent to Ningaloo Reef interact to create the conditions for enhanced productivity seen in this region (Sleeman et al. 2007 in DSEWPaC 2012a). The canyons are also repositories for particulate matter deposited from the shelf and sides of the canyons and serve as conduits for organic matter between the surface, shelf and abyssal plains (DSEWPaC 2012a).

The soft bottom habitats within the canyons themselves are likely to support important assemblages of epibenthic species. Biological productivity at the head of Cape Range Canyon in particular, is known to support species aggregations, including whale sharks, manta rays, humpback whales, sea snakes, sharks, large predatory fish

and seabirds. The canyons are thought to be significant contributors to the biodiversity of the adjacent Ningaloo Reef, as they channel deep water nutrients up to the reef, stimulating primary productivity (DEWHA 2008c).

This KEF is located wholly within the EMBA.

### 10.1.4. Exmouth Plateau

The Exmouth Plateau is defined as a KEF as it is a unique sea floor feature with ecological properties of regional significance. The Exmouth Plateau covers an area of 49,310 km$^2$ and is located approximately 150 km northwest of Exmouth. The plateau ranges in water depths from 800 to 4,000 m (Heap & Harris 2008 in DSEWPaC 2012a). The plateau's surface is rough and undulating at 800–1,000 m depth. The northern margin is steep and intersected by large canyons (e.g. Montebello and Swan canyons) with relief greater than 50 m. The western margin is moderately steep and smooth, and the southern margin is gently sloping and virtually free of canyons (Falkner et al. 2009 in DSEWPaC 2012a).

The Exmouth Plateau is a regionally and nationally unique tropical deep-sea plateau. It that may serve an important ecological role by acting as a topographic obstacle that modifies the flow of deep waters that generate internal tides, causing upwelling of deeper water nutrients closer to the surface (Brewer et al. 2007). Sediments on the plateau suggest that biological communities include scavengers, benthic filter feeders and epifauna. Whaling records from the 19th century suggest that the Exmouth Plateau may have supported large populations of sperm whales (Bannister et al. 2007). Fauna in the pelagic waters above the plateau are likely to include small pelagic species and nekton (Brewer et al. 2007).

This KEF is located partially within the EMBA.

### 10.1.5. Mermaid Reef and Commonwealth Waters surrounding Rowley Shoals

Mermaid Reef and Commonwealth waters surrounding Rowley Shoals is defined as a KEF for its enhanced productivity and high species richness. The Rowley Shoals are a group of three atoll reefs—Clerke, Imperieuse and Mermaid reefs—located about 300 km north-west of Broome. Mermaid Reef lies 29 km north of Clerke and Imperieuse reefs and is totally submerged at high tide. Mermaid Reef and Commonwealth Waters surrounding Rowley Shoals are regionally important in supporting high species richness, higher productivity and aggregations of marine life associated with the adjoining reefs themselves (Done et al. 1994). Rowley shoals contain 214 coral species and approximately 530 species of fishes (Gilmour et al. 2007), 264 species of molluscs and 82 species of echinoderms (Done et al. 1994; Gilmour et al. 2007). Both coral communities and fish assemblages differ from similar habitats in eastern Australia (Done et al. 1994).

Mermaid Reef falls under Commonwealth jurisdiction and forms the Mermaid Reef Commonwealth Marine Park. Clerke and Imperieuse reefs constitute the Rowley Shoals Marine Park, which falls under Western Australian Government jurisdiction (EA 2000). The Rowley Shoals are discussed with the Commonwealth and State Marine Park (**Sections 11.1.6** and **12.3.8**).

This KEF is located wholly within the EMBA.

### 10.1.6. Glomar Shoals

The Glomar Shoals are a submerged feature situated at a depth of 33–77 m, approximately 150 km north of Dampier on the Rowley Shelf (Falkner et al. 2009 in DSEWPaC 2012a). They consist of a high percentage of marine-derived sediments with high carbonate content and gravels of weathered coralline algae and shells (McLoughlin & Young 1985 in DSEWPaC 2012a). The area's higher concentrations of coarse material compared to surrounding areas are indicative of a high energy environment subject to strong sea floor currents (Falkner et al. 2009 in DSEWPaC 2012a).

Biological communities found at the Glomar Shoals have not been comprehensively studied, however the shoals are known to be an important area for a number of commercial and recreational fish species such as rankin cod, brown striped snapper, red emperor, crimson snapper, bream and yellow-spotted triggerfish. Catch rates at the Glomar Shoals are high, indicating that the area is a region of high productivity (Falkner et al. 2009, Fletcher & Santoro 2009 in DSEWPaC 2012a). It is unclear whether the removal of non-target species due to the commercial fishing over the shoals is having an impact on its value (DSEWPaC 2012a).

The Glomar Shoals are regionally important for their potentially high biological diversity and localised productivity. Biological data specific to the Glomar Shoals is limited, however the fish of the shoals are probably a subset of reef-dependent species and anecdotal evidence suggests they are particularly abundant (DSEWPaC 2012a).

This KEF is located wholly within the EMBA.

### 10.1.7. Ancient Coastline at 125 m Depth Contour

The shelf of the North-west Marine Region contains several terraces and steps which reflect changes in sea level that occurred over the last 100,000 years. The most prominent of these features occurs at a depth of 125 m as an escarpment along the North West Shelf and Sahul Shelf (DSEWPaC 2012a). Where the ancient, submerged coastline provides areas of hard substrate it may contribute to higher biological diversity in areas otherwise dominated by soft sediments. Little detailed knowledge was available at the time of its designation, but it was thought that the hard substrate of the escarpment is likely to support sponges, crinoids, molluscs, echinoderms (DSEWPaC 2012a) and that changes in topography at these depths are critical points for the generation of internal waves (Holloway et al. 2001 cited in DEWHA 2008c), playing a minor role in aiding localised upwelling or at least regional mixing associated with the seasonal changes in currents and winds. It was hypothesised that this prominent floor feature could be important as a migratory pathway for cetaceans and pelagic species such as the whale shark and humpback whale, as they move north and south between feeding and breeding grounds (DEWHA 2008c). Enhanced productivity could potentially be attracting baitfish, which in turn provide food for the migratory species. The pressures of potential concern on the biodiversity value of this feature generally include ocean acidification as a result of climate change (DoEE 2019a).

Currey-Randall et al. (2021) investigated drivers of fish species richness and assemblage composition spanning six degrees of latitude along sections of the ancient coastline, categorised as ‘on’ and ‘off’ the ancient coastline at 125m KEF (AC125) based on depth, across a range of habitats and seafloor complexity (~60–180 m depth). While some surveyed sections of the AC125 had hard bottom substrate and supported enhanced fish diversity, including over half of the total species observed, species richness and abundance overall were not greater on the AC125 than immediately adjacent to the AC125. Instead, depth, seafloor complexity and habitat type explained patterns in richness and abundance, and structured fish assemblages at both local and broad spatial scales. Fewer fishes were associated with deep sites characterized by negligible complexity and soft-bottom habitats, in contrast to shallower depths that featured benthic biota and pockets of complex substrate. Drivers of abundance of common species were species-specific and primarily related to sampling areas, depth and substrate. Fishes of the ancient coastline and adjacent habitats are representative of mesophotic fish communities of the region, included species important to fisheries and conservation, and several species were observed deeper than their currently known distribution.

Wakeford et al. (2023) investigated the bathymetry, sedimentology and benthic habitats at 5 locations across the AC125 using multibeam sonar, sediment samples and towed video imagery. Approximately 98% of the seabed surveyed was comprised of unconsolidated soft sediment habitat (mud/sand/silt) supporting negligible epibenthic biota. The prevalence of soft sediment suggests that post-glacial sediments have infilled parts of the ancient coastline), with cross-shelf, probably tidal currents in the northern section of the study area responsible for some of the sediment mobilisation and southern study areas more influenced by oceanic conditions. Within study areas, total biotic cover ranged from 0.02% to 1.07%. Of the biota encountered, most comprised filter feeder organisms (including gorgonians, sponges, and whip corals) whose distribution was associated with pockets of consolidated hard substrate. Benthic community composition varied with both study area and position in relation to the predicted AC125. In general, consolidated substrate was proportionally higher in water shallower than the AC125 compared to on the AC125 or deeper than the AC125. Spatially continuous maps of predicted benthic habitat classes (pre-determined benthic communities) in each study area were developed to characterise biodiversity. Spatial modelling corroborated depth and large-scale structural complexity of the seafloor as surrogates for predicting likely habitat class. The study provided an important assessment of the AC125 and concluded that if a distinct coastline exists in the areas surveyed, it is now largely buried and as such does not provide a unique hard substrate habitat.

This KEF is located partially within the EMBA.

### 10.1.8. Canyons Linking the Argo Abyssal Plain with Scott Plateau

The Scott Plateau connects with the Argo Abyssal Plain via a series of canyons, the largest of which are the Bowers and Oates canyons (DSEWPaC 2012a). The canyons are believed to be up to 50 million years old and excavated during the evolution of the region through sediment and water movements (DEWHA 2008d). The canyons cut deeply into the south-west margin of the Scott Plateau and act as conduits for transport of sediments from an approximate depth of 2,000–3,000 m to depths of more than 5,500 m (DSEWPaC 2012a). The water masses at these depths are deep Indian Ocean water on the Scott Plateau and Antarctic bottom water on the Argo Abyssal Plain. Both water masses are cold, dense and nutrient-rich (Lyne et al. 2006 in DSEWPaC 2012a). The high productivity of the region is believed to be led by topographically induced water movements through the canyons and the action of internal waves in these canyons as well as around islands and reefs. The canyons are

therefore thought to be linked to small and periodic upwellings that enhance this biological productivity (DEWHA 2008d).

The Canyons linking the Argo Abyssal Plain and Scott Plateau are likely to be important features due to their historical association with sperm whale aggregations (DSEWPaC 2012a). Historical records of whaling in the Timor region indicate that the number of sperm whales was high in the region in the past. Though current numbers are unknown, it is possible that they congregate around the canyon heads adjacent to the Scott Plateau, encouraged by the high biological productivity, supporting stocks of their prey (DEWHA 2008d). There is anecdotal evidence that supports the idea that the Scott Plateau itself may be a breeding ground for sperm and beaked whales. It is also likely that important demersal communities occur in the canyons, as they do in the Scott Plateau supported by the localised upwelling, which in turn attract larger predatory fish, sharks and cetaceans (DEWHA 2008d).

This KEF is located wholly within the EMBA.

### 10.1.9. Continental Slope Demersal Fish Communities

The Australian Continental Slope provides important habitat for demersal fish communities, characterised by high endemism and species diversity. Specifically, the continental slope between North West Cape and the Montebello Trough is the most diverse slope bioregion in Australia with more than 500 fish species, 76 of which are endemic (Last et al. 2005 in DSEWPaC 2012).

The Continental Slope consists of two distinct community types, associated with the upper and mid slope, 225 – 500 m and 750 – 1000 m respectively. The Timor Province and Northwest Transition bioregions are the second-richest areas for demersal fish across the entire continental slope (DSEWPaC 2012). The bacteria and fauna that is present in the system on the Continental Slope are the basis for the food web for demersal fish and higher order consumers in the system. Further information of this system has been poorly researched, though it has been suggested that it is a detritus-based system, where infauna and epifauna become prey for a range of teleost fish, molluscs and crustaceans (Brewer et al. 2007). The higher order consumers supported by this system are likely to be carnivorous fish, deep water sharks, large squid and toothed whales (Brewer et al. 2007). The pelagic production is known to be phytoplankton based, with hotspots located around oceanic reefs and islands (Brewer et al. 2007).

It is believed that the loss of the benthic habitat along this continental shelf region would likely lead to a decline in the species diversity and endemism that this feature is associated with (DoEE 2019a). The endemism of the region is not supported by large data sets and is scarce. It is consequently not well understood what interactions exist between the physical processes and trophic structures that lead to this high diversity of fish and the suggested presence of endemic species in the region (DoEE 2019a).

This KEF is located partially within the EMBA.

### 10.1.10. Seringapatam Reef and Commonwealth Waters in the Scott Reef Complex

Scott and Seringapatam reefs are part of a series of submerged reef platforms that rise steeply from the sea floor between the 300–700 m contours on the north-west continental slope and lie in the Timor Province (Falkner et al. 2009). Scott Reef consists of two separate reef formations, North Reef and South Reef. The total area of the key ecological feature is approximately 2,418 km². As two of the few offshore reefs in the north-west, they provide an important biophysical environment in the region.

Scott and Seringapatam reefs and the waters surrounding them attract aggregations of marine life including humpback whales on their northerly migration, Bryde's whales, pygmy blue whales, Antarctic minke whales, dwarf minke whales, minke whales, dwarf sperm whales and spinner dolphins (Jenner et al. 2008; Woodside 2009). Whale sharks and several species of sea snakes have also been recorded in this area (Donovan et al. 2008). Green and hawksbill turtles nest during the summer months on Sandy Islet on South Scott Reef. These species also internest and forage in the surrounding waters (Guinea 2006). Scott Reef is a particularly biologically diverse system and includes more than 300 species of reef-building corals, approximately 400 mollusc species, 118 crustacean species, 117 echinoderm species and around 720 fish species (Woodside 2009). Corals and fish at Scott Reef have higher species diversity than the Rowley Shoals (Done et al. 1994).

This KEF is located partially within the EMBA.

Scott Reef is listed as Commonwealth Heritage Places and is discussed in **Section 9.4.1**.

# 11. State Marine Conservation Reserves

## 11.1. Introduction

Marine parks and reserves have been progressively established in Western Australia since 1987 and the Northern Territory since 1983. The Conservation and Parks Commission (CPC) is the vesting authority for marine parks and reserves under the provisions of the *Conservation and Land Management Act 1984*. Parks and Wildlife, within the Department of Biodiversity, Conservation and Attractions (DBCA), is responsible for day-to-day management of the parks.

There are three categories of state marine conservation reserves: marine parks; marine management areas; and marine nature reserves.

Marine parks are created to protect natural features and aesthetic values while allowing recreational and commercial uses that do not compromise conservation values. There are currently 5 marine parks wholly or partially within the EMBA (refer **Figure 15**).

Marine parks are multiple-use reserves that cater for a wide range of activities. Within marine parks there may be four types of management zones: recreation zones: general use zones; no-take areas known as sanctuary zones; and special purpose zones.

Each marine park has a ‘management plan’ that contains strategies to protect the high value assets in the park, as well as permitted activities tables. These tables provide explicit regulatory management.

Sanctuary zones are ‘no-take' areas created primarily for conservation and scientific research and are designed to protect a particular significant ecosystem or habitat. Low-impact tourism may be permitted, but no recreational or commercial fishing, aquaculture, pearling, petroleum drilling or production is allowed.

Marine management areas provide an integrated management structure over areas that have high conservation value and intensive multiple-use. There are two marine management areas within the EMBA (described below).

There is currently only one state marine nature reserve: Hamelin Pool Nature Reserve part of the Shark Bay World Heritage Area (**Section 9.1.1**).

### 11.1.1. Ningaloo Marine Park

The Ningaloo Marine Park was declared in May 1987 under the National Parks and Wildlife Conservation Act 1975 (Commonwealth). The Ningaloo Coast, incorporating both key marine and terrestrial values was later granted World Heritage Status in June 2011. In November 2012, the Ningaloo Marine Park (Commonwealth Waters) was renamed to be incorporated in the North-west Commonwealth Marine Reserves Network. The park covers an area of 263,343 km$^2$, including both State and Commonwealth waters, extending 25 km offshore.

The park protects a large portion of Ningaloo Reef, which stretches over 300 km from North West Cape south to Red Bluff. It is the largest fringing coral reef in Australia, forming a discontinuous barrier that encloses a lagoon that varies in width from 200 m to 7 km. Gaps that regularly intercept the main reef line provide channels for water exchange with deeper, cooler waters (CALM 2005). The Ningaloo Marine Park forms the backbone of the nature-based tourism industry, and recreational activities in the Exmouth region. Seasonal aggregations of whale sharks, manta rays, sea turtles and whales, as well as the annual mass spawning of coral attract large numbers of visitors to Ningaloo each year (CALM 2005).

The reef is composed of partially dissected basement platform of Pleistocene marine or Aeolian sediments or tertiary limestone, covered by a thin layer of living or dead coral or macroalgae. Key features that characterise the Ningaloo Reef include (CALM 2005):

- Over 217 species of coral (representing 54 genera)
- Over 600 species of mollusc (clams, oysters, octopus, cuttlefish, snails)
- Over 460 species of fish
- Ninety-seven species of echinoderms (sea stars, sea urchins, sea cucumbers)
- Habitat for numerous threatened species, including whales, dugong, whale sharks and turtles

- Habitat for over 25 species of migratory wading birds listed in CAMBA and JAMBA.

Ningaloo marine park is located partially within the EMBA.

### 11.1.2. Muiron Islands Marine Management Area

The Ningaloo Marine Park Management Plan (CALM 2005) created a marine management area (MMA) for the Muiron Islands, immediately adjacent to the northern end of the Park. This is managed as an integrated area together with the Ningaloo Marine Park, but its status as an MMA means that some activities, including oil and gas exploration, are still permitted under a strict environmental assessment process involving DMIRS.

The Muiron Islands located 15 km north-east of the North West Cape, comprise the North and South Muiron Islands and cover an area of 1,400 ha (AHC 2006). They are low limestone islands (maximum height of 18 m above sea level (ASL)) with some areas of sandy beaches, macroalgae and seagrass beds in the shallow waters (particularly on the eastern sides) and coral reef up to depths of 5 m, which surrounds both sides of South Muiron Island and the eastern side of North Muiron Island. The Muiron Islands MMA was WA's first MMA, gazetted in November 2004. It covers an area of 28,616 ha and occurs entirely within state waters (CALM 2005).

Muiron Islands are located wholly within the EMBA.

### 11.1.3. Barrow Island Marine Park

The Barrow Island Marine Park covers 4,169 ha, all of which is zoned as sanctuary zone (the Western Barrow Island Sanctuary Zone) (DEC 2007). It includes Biggada Reef, an ecologically significant fringing reef, and Turtle Bay, an important turtle aggregation and breeding area (DEC 2007). Representative areas of seagrass, macroalgal and deep-water habitat are also represented within the marine park (DEC 2007). Passive recreational activities (such as snorkelling, diving and boating) are permitted but extractive activities such as fishing and hunting are not.

Barrow Island marine park is located wholly within the EMBA.

### 11.1.4. Barrow Island Marine Management Area

The Barrow Island MMAis the largest reserve within the Montebello/ Barrow Islands marine conservation reserves, covering 114,693 ha (DEC 2007). The MMA includes most of the waters around Barrow Island, the Lowendal Islands and the Barrow Island Marine Park, with the exclusion of the port areas of Barrow Island and Varanus Island.

The MMA is not zoned apart from one specific management zone: the Bandicoot Bay Conservation Area. This conservation area is on the southern coast of Barrow Island and has been created to protect benthic fauna and seabirds. It includes the largest intertidal sand/mudflat community in the reserves, is known to be high in invertebrate diversity and is an important feeding area for migratory birds.

As for the other reserves in the Montebello/Barrow Islands marine conservation reserves, the Barrow Island MMA includes significant breeding and nesting areas for marine turtles and the waters support a diversity of tropical marine fauna, important coral reefs and unique mangrove communities (DEC 2007). Green, hawksbill and flatback turtles regularly use the island's beaches for breeding, and loggerhead turtles are also occasionally sighted.

Barrow Island MMA is located wholly within the EMBA.

### 11.1.5. Montebello Islands Marine Park

Montebello/ Barrow/ Lowendal Islands are part of a shallow submarine ridge, which extends north from the mainland near Onslow. The ridge contains extensive areas of intertidal and shallow subtidal limestone pavement surrounding the numerous, mostly small islands which are found in the region. The seabed is generally less than 5 m deep and consists of sand veneered limestone pavement with patches of fringing coral reef (DEC 2007).

The island chain lies entirely within WA State waters, with the State-Commonwealth boundary extending out to encompass the islands and waters 3 nm west of Barrow Island and north of the Montebello Islands. These islands are protected within as marine conservation reserves: Montebello Islands Marine Park, Barrow Islands Marine Park and Barrow Island Marine Management Area.

The Montebello Islands Marine Park (58,331 ha) consists of two sanctuary zones, two recreation zones, one special purpose zone for benthic protection, 11 special purpose zones for pearling and general use zones.

The Montebello Islands comprise over 100 islands, the majority of which are rocky outcrops; rocky shore accounts for 81 % of shoreline habitat (DEC 2007a).

The ecological and conservation values of the Montebello and Barrow Islands Marine Conservation Reserve (MCR) include important habitats including corals reefs and bommies, mangroves, seagrass and macroalgae meadows, rocky shorelines and hard substrate, intertidal sand and mudflat communities. These habitats provide protection, food and habitat for a large diversity of species, including dugongs, turtles, whales, other protected cetaceans and birds as well as sea snakes and fish. The area is considered to have a high biodiversity. The islands also provide feeding and resting areas for migrating shorebirds and seabird nesting areas.

Socio-economic values of the Montebello and Barrow Islands MCR include hydrocarbon exploration and production, pearling, nature-based tourism, commercial and recreational fishing, water sports, European history and maritime heritage and scientific research (DEC 2007)

Special purpose zones for pearling are established for the existing leaseholder to allow pearling to be the priority use of these areas (DEC 2007a). Commercial fishing includes a trap fishery for reef fishes, mainly in water depths of 30–100 m, and wet lining for reef fish and mackerel. Fish trawling also occurs in the waters near to the Montebello Islands. A tourist houseboat operates out of Claret Bay, at the southern end of Hermite Island, during the winter months. The Montebello Islands are becoming more frequently used by recreational boaters for camping, fishing and diving activities.

Montebello Islands marine park is located wholly within the EMBA

### 11.1.6. Rowley Shoals Marine Park

The Rowley Shoals (including the Commonwealth-managed Mermaid Reef Marine National Nature Reserve) are located approximately 300 km west-northwest of Broome, lying between 17°07’S, 119°36’E and 17°35’S, 118°56’E and encompassing approximately 87,674 ha (DEC 2007b).

The Rowley Shoals is ecologically significant in that the reefs form part of a series of important ecological “stepping stones” for a range of reef biota originating in Indonesian/west Pacific waters. Their position off the north-west Australian coast, an area of few offshore reef systems, provides an important upstream source for recruitment to reefs further south (DEC 2007b). Marine wildlife includes 184 species of corals, primarily Indo-West Pacific species, indicating the strong affinity of the Rowley Shoals communities with Indonesia. In terms of other species, at least 264 species of molluscs, 82 species of echinoderms and 389 species of finfish were also identified (DEC 2007b). The faunal assemblages of the Rowley Shoals Marine Park are regionally significant as they contain large numbers of species not found in the more turbid coastal environments of tropical Western Australia (DEC 2007b). There is a relatively low level of recreational and commercial activity, mostly attributed to the remoteness of the Shoals with access difficult from both Indonesia and mainland Australia (DEC 2007b).

Rowley Shoals marine park is located wholly within the EMBA.

### 11.1.7. Eighty Mile Beach Marine Park

The Eighty Mile Beach Marine Park, located between Port Hedland and Broome, was gazetted on 29 January 2013. It covers an area of approximately 200,000 ha stretching for some 220 km from Cape Missiessy to Cape Keraudren, and includes sanctuary, recreation, general use and special purpose zones. The park is managed under the Eighty Mile Beach Marine Park Management Plan 2014-20124 (DPaW, 2014).

The listed ecological values of the Eighty Mile Beach Marine Park include the high sediment and water quality, the juxtaposition of the beach, coastal topography and seabed and the diverse and ecologically important habitats and marine/coastal flora and fauna. The listed habitat values of the marine park are as follows:

- The intertidal sand and mudflat communities supporting a high abundance and diversity of invertebrate life and providing a valuable food source for shorebirds (including migratory species) and other fauna.
- The diverse subtidal filter-feeding communities
- Macroalgal and seagrass communities providing habitat and feeding opportunities for fish, invertebrates and dugongs.
- High diversity intertidal and subtidal coral reef communities
- Mangrove communities and adjacent saltmarshes provide nutrients to the surrounding waters and habitat for fish and invertebrates.

The listed marine and coastal fauna values are as follows:

- A high diversity and abundance of nationally and internationally important shorebirds and waders (including migratory species) are found in the marine park.
- Flatback turtles are endemic to northern Australia and nest at Eighty Mile Beach
- Dugongs and several whale and dolphin species inhabit or migrate through the marine park.
- A highly diverse marine invertebrate fauna provides an important food source for a variety of animals, including birds, fish and turtles, along with recreational and commercial fishing opportunities.
- A diversity of fish species provides recreational and commercial fishing opportunities.
- A diversity of sharks and rays, including several protected species, are found in the park.

In addition to these natural values, the marine park contains land and sea important to traditional Indigenous owners through identity and place, family networks, spiritual practice and resource gathering. The marine park also has a history of European activity including exploration, pastoralism and commercial fishing (e.g. the pearl oyster fishery). The park contains a historical WWII plane wreck (*Dornier Do-24 X-36*) and shipwrecks (two pearl luggers). The marine park provides tourism opportunity and recreational value through its remoteness, diversity and abundance of habitats and marine fauna and the pristine nature of the marine and coastal environment.

The marine park contains vast intertidal sand and mudflats that extend up to 4 km wide at low tide and provide a rich source of food for many species. Eighty Mile Beach Marine Park is one of the world's most important feeding grounds for small wading birds that migrate to the area each summer, travelling from countries thousands of kilometres away (DPaW 2014).

Eighty Mile Beach marine park is located wholly within the EMBA

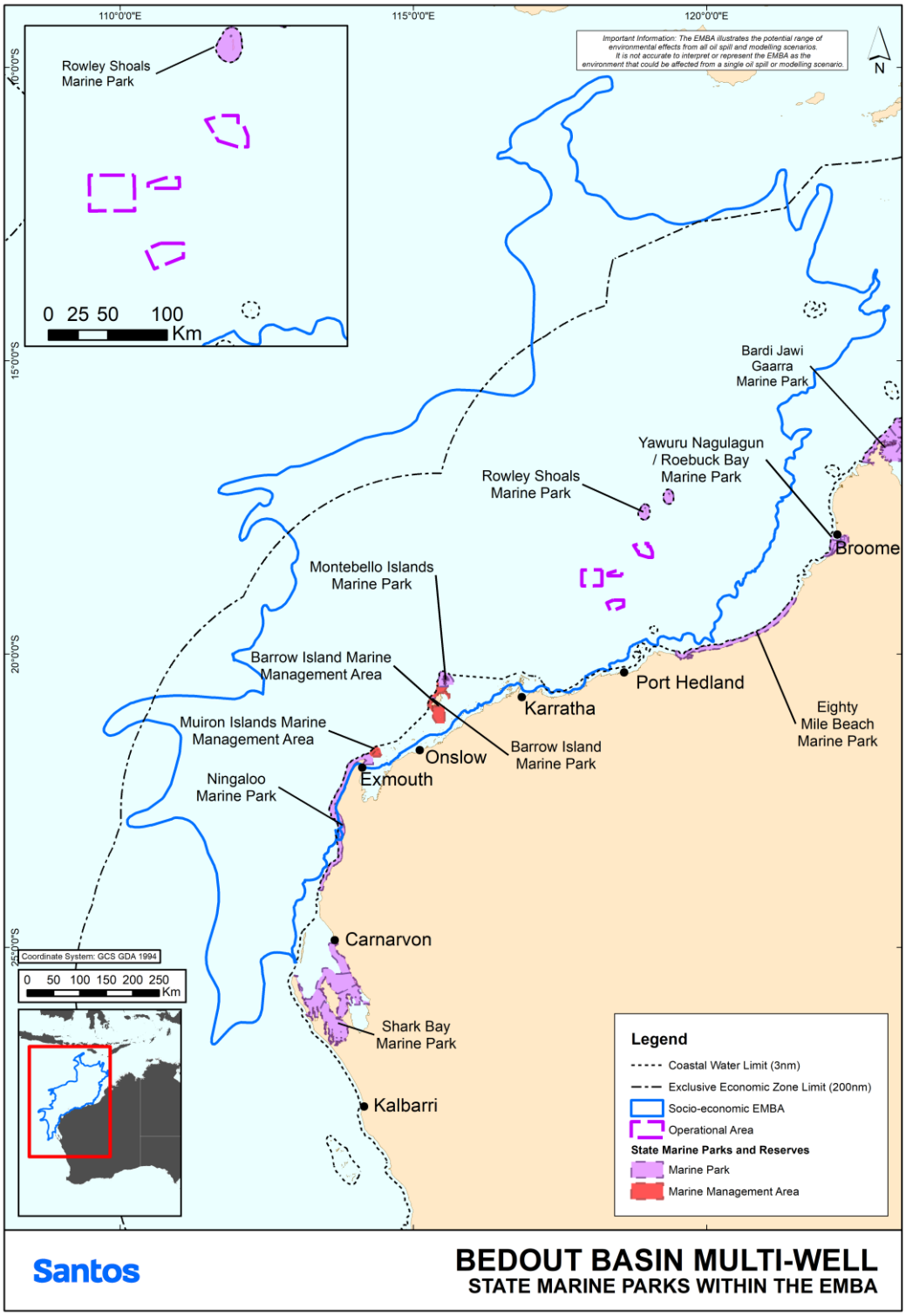



**Figure 15: Protected areas in and adjacent to the EMBA – WA State Marine Parks and Management Areas**

# 12. Australian Marine Parks

## 12.1. Introduction

In agreement with the states and territory governments, the Australian Commonwealth government committed to establish Commonwealth marine parks as a component of the National Representative System of Marine Protected Areas (DoE 2014). In November 2012, the Commonwealth Marine Reserves Network was proclaimed with the purpose of protecting the biological diversity and sustainable use of the marine environment (Director of National Parks 2012a). Commonwealth Marine Reserves were renamed as Australian Marine Parks in October 2017. Seven marine regions are included in the Australian Marine Parks Network, including the Coral Sea, the South-west, the Temperate East, the South-east, the North, the North-west and Indian Ocean Marine Territories. The South-east network 10-year Management Plan came into effect on 1 July 2013. The remaining networks 10-year Management Plans were approved and came into effect on 1 July 2018. The Indian Ocean Marine Territories draft management plans were open for public consultation from 6 July to 17 August 2023 after Christmas Island Marine Park and Cocos (Keeling) Islands Marine Park were declared in March 2022.The new management plans establish the management and zoning of the designated marine parks. The marine park networks pertinent (i.e. marine parks wholly or partially within the EMBA) to the EMBA include the:

- South-West Marine Parks Network
- North-West Marine Parks Network

The South-West Marine Parks Network comprises 14 marine parks. One of these, none occur in in the EMBA.

The North-West Marine Parks Network comprises 13 marine parks which all occur in West Australian waters pertinent to the EMBA:

- Shark Bay AMP
- Gascoyne AMP
- Ningaloo Marine AMP
- Montebello Marine AMP
- Dampier Marine AMP
- Eighty Mile Beach Marine AMP
- Argo-Rowley Terrace Marine AMP
- Mermaid Reef Marine AMP \
- Kimberley AMP

The sizes of these marine parks range from 300—152,000 km$^2$, and the water depths within the marine parks vary from approximately 15—1,500 m deep. The EPBC Act requires that each management plan assign an International Union for the Conservation of Nature (IUCN) category to each marine park. Additionally, the Act also allows for the management plan to divide a marine park into zones and to assign a category to each zone, which may differ from the overall category of the marine park. Zoning considers the purposes for which the marine parks were declared, the objectives of the relevant management plans, the values of the marine park and requirements of the EPBC Act and EPBC Regulations.

The North-West Marine Parks Network includes six different types of zoning:

- Sanctuary Zone (IUCN Category Ia)
- National Park Zone (IUCN Category II)
- Recreational Use Zone (IUCN Category IV)

- Habitat Protection Zone (IUCN Category IV)
- Multiple Use Zone (IUCN Category VI)
- Special Purpose Zone (Trawl) (VI).

The South-west Marine Parks Network includes six different types of zoning:

- National Park Zone (IUCN Category II)
- Habitat Protection Zone (IUCN Category IV)
- Multiple Use Zone (IUCN Category VI)
- Special Purpose Zone (Mining Exclusion) (IUCN Category VI)
- Special Purpose Zone (IUCN Category VI)
- Special Purpose Zone (Trawl) (IUCN Category VI).

A summary of the South-West and North-West Marine Parks Networks is provided below.

Australian Marine Parks within the EMBA are shown in

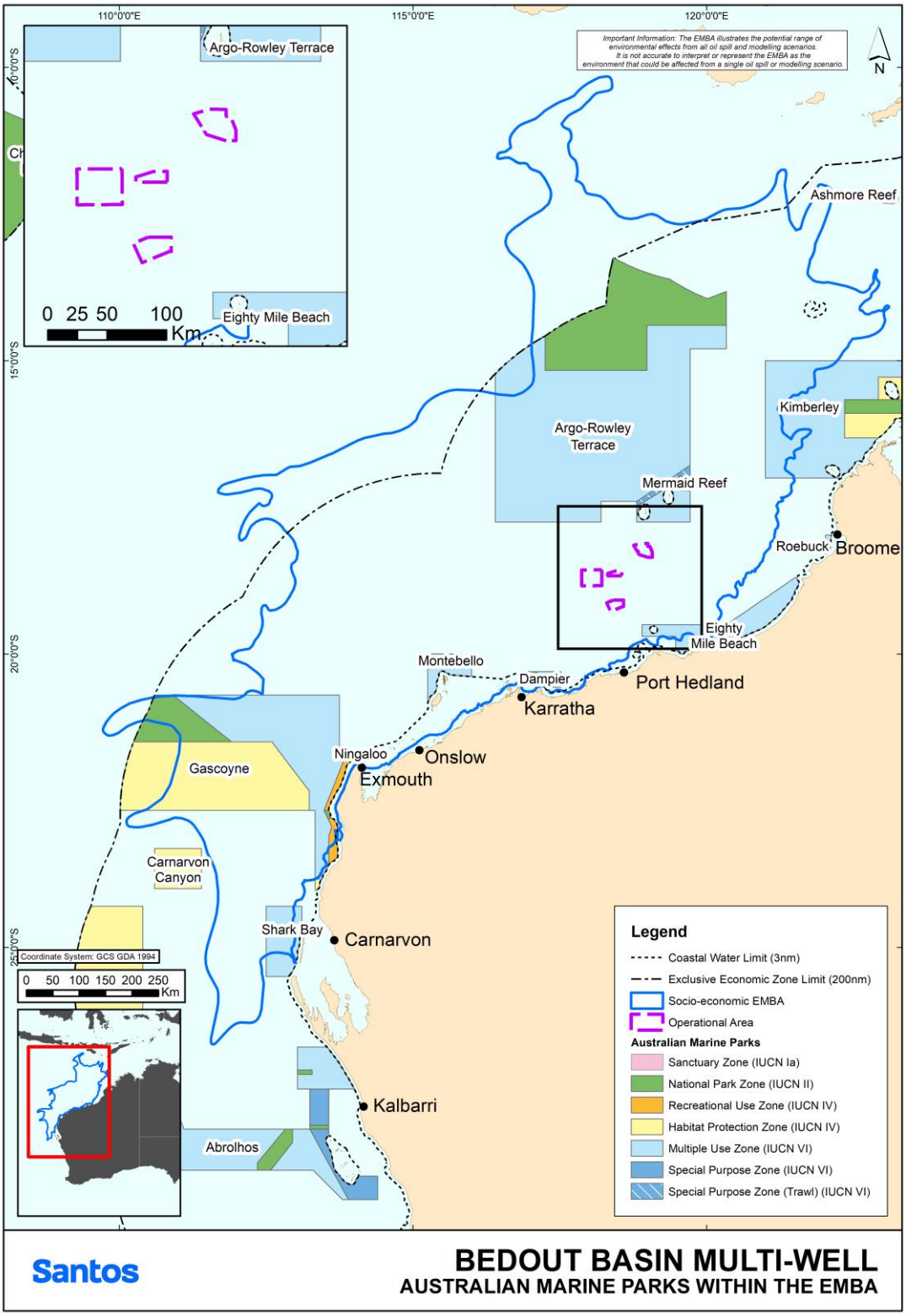



**Figure 16: Protected areas adjacent to the EMBA – Australian Marine Parks**

## 12.2. South-West Marine Parks Network

The South-West Commonwealth Marine Parks Network is aligned to the South-West Marine Region. The network covers 508,371 km$^2$ and includes 14 marine parks (Director of National Parks, 2018a). Broad values of the South-west Australian Marine Parks include:

- Natural values
- Cultural values
- Heritage values
- Socio-economic values.

Further detail on each of the relevant marine parks those that fall (wholly or partially) within the EMBA is provided below.

### 12.2.1. Abrolhos Marine Park

The Abrolhos Marine Park (including zones: Marine National Park Zone – IUCN Category II-2,548 km$^2$; Habitat Protection Zone – IUCN Category VI-23,239 km$^2$; Multiple Use Zone – IUCN Category VI-56,545 km$^2$; Special Purpose Zone – IUCN Category VI-5,729 km$^2$) covers an area of approximately 88,060 km$^2$ and protects the following conservation values (Director of National Parks, 2018a):

- Important foraging areas for the:
  - Threatened Australian lesser noddy.
  - Northernmost breeding colony of the threatened Australian sea lion
  - Great white sharks
  - Migratory common noddy, wedge-tailed shearwater, bridled tern, Caspian tern and roseate tern.
- Important migration habitat for the protected humpback whale and pygmy blue whales
- The second largest canyon on the west coast, the Houtman Canyon
- Examples of the northernmost ecosystems of the Central Western Province and South-west Shelf Transition (including the Central West Coast meso-scale bioregion)
- Examples of the deeper ecosystems of the Abrolhos Islands meso-scale bioregion
- Examples of the shallower, southernmost ecosystems of the Central Western Shelf Province provincial bioregion including the Zuytdorp meso-scale bioregion
- Examples of the deeper ecosystems of the Central Western Transition provincial bioregion
- Examples of diversity of sea floor features including southern most banks and shoals of the North-west region; deep holes and valleys; slope habitats; terrace and shelf environments
- Seven KEFs.

The Abrolhos Marine Park is adjacent to the Shark Bay World Heritage Property. The marine park does not contain any Commonwealth or National Heritage listings (Director of National Parks 2018a). The marine park contains 11 known shipwrecks listed under the *Underwater Culture Heritage Act 2018*. Commercial tourism, fishing, recreation (e.g. fishing, snorkelling, diving and boating) and mining are important supported socio-economic activities in the park (Director of National Parks 2018a).

## 12.3. North-West Marine Park Network

The North-West Marine Parks Network is aligned to the North-west Marine Region. The network covers 335, 341 km$^2$ and includes 13 marine parks (Director of National Parks, 2018b). Broad values of the North-west Commonwealth Marine Reserves Network include:

- Natural values
- Cultural values

- Heritage values
- Socio-economic values.

Further detail on each of the relevant marine parks within the EMBA is provided below. See **Section 12.1** for extent of marine parks (wholly or partially) within the EMBA.

### 12.3.1. Shark Bay Marine Park

The Shark Bay Marine Park (Multiple Use Zone – IUCN Category VI) covers an area of approximately 7,443 km$^2$ and protects the following conservation values (Director of National Parks 2018b):

- Foraging areas adjacent to important breeding areas for several species of migratory seabirds
- Part of the migratory pathway of protected humpback whales
- Internesting habitat for marine turtles
- Waters that are adjacent to the largest nesting area for loggerhead turtles in Australia
- Marine Park and adjacent coastal areas important for shallow-water snapper
- Protection to shelf and slope habitats as well as a terrace feature
- Examples of the shallower ecosystems of the Central Western Shelf Province and Central Western Transition provincial bioregions including the Zuytdorp meso-scale bioregion
- Connectivity between the inshore waters of the Shark Bay World Heritage Area and the deeper waters of the area.

Whilst no listed international, Commonwealth or National Heritage places are within the marine park, the park is adjacent to Shark Bay World Heritage Area (Director of National Parks 2018b). Commercial tourism, fishing, mining and recreation (e.g. fishing) are important socio-economic values of the park (Director of National Parks 2018b).

### 12.3.2. Gascoyne Marine Park

The Gascoyne Marine Park (Multiple Use Zone – IUCN Category VI-33,652 km$^2$; Habitat Protection Zone – IUCN Category IV-38,982 km$^2$; Marine National Park Zone – IUCN Category II-9,132 km$^2$) covers an area of approximately 81,766 km$^2$ and protects the following conservation values (Director of National Parks 2018a):

- Important foraging areas for: migratory seabirds threatened and migratory hawksbills and flatback turtles; and vulnerable and migratory whale shark.
- A continuous connectivity corridor from shallow depths around 15 m out to deep offshore waters on the abyssal plain at over 5,000 m in depth
- Sea floor features including canyon, terrace, ridge, knolls, deep hole/valley and continental rise. It also provides protection for sponge gardens in the south of the reserve adjacent to Western Australian coastal waters.
- Ecosystems examples from the Central Western Shelf Transition, the Central Western Transition and the Northwest province provincial bioregions as well as the Ningaloo meso-scale bioregion
- Four KEFs for the region:
  - Canyons on the slope between the Cuvier Abyssal Plain and the Cape Range Peninsula (enhanced productivity, aggregations of marine life and unique sea-floor feature)
  - Exmouth Plateau (unique sea-floor feature associated with internal wave generation)
  - Continental slope demersal fish communities (high species diversity and endemism – the most diverse slope bioregion in Australia with over 500 species found with over 64 of those species occurring nowhere else)
  - Commonwealth waters adjacent to Ningaloo Reef.
- The canyons in this reserve are believed to be associated with the movement of nutrients from deep water over the Cuvier Abyssal Plain onto the slope where mixing with overlying water layers occurs at the canyon

heads. These canyon heads, including that of Cloates Canyon, are sites of species aggregation and are thought to play a significant role in maintaining the ecosystems and biodiversity associated with the adjacent Ningaloo Reef

- The reserve therefore provides connectivity between the inshore waters of the existing Ningaloo Commonwealth marine park and the deeper waters of the area.

The park is also adjacent to World Heritage listings associated with the Ningaloo Coast. Commercial tourism, commercial fishing, mining and recreation are important socio-economic values of the park (Director of National Parks 2018b).

### 12.3.3. Ningaloo Marine Park

Ningaloo Marine Park stretches approximately 300 km along the west coast of the Cape Range Peninsula and is adjacent to the Western Australian Ningaloo Marine Park and Gascoyne Marine Park (Director of National Parks, 2018b). Ningaloo Reef is the longest fringing barrier reef in Australia forming a discontinuous barrier that encloses a lagoon that varies in width from 200 m to 7 km. Gaps that regularly intercept the main reef line provide channels for water exchange with deeper, cooler waters (CALM 2005). It is the only example in the world of extensive fringing coral reef on the west coast of a continent.

The Ningaloo Marine Park (Recreational Use Zone – IUCN Category II) covers an area of approximately 2,435 km$^2$ and protects the following conservation values (Director of National Parks 2018a):

- Important habitat (foraging areas) for vulnerable and migratory whale sharks
- Areas used for foraging by marine turtles adjacent to important internesting sites
- Part of the migratory pathway of the protected humpback whale
- Foraging and migratory pathway for pygmy blue whales
- Breeding, calving, foraging and nursing habitat for dugong
- Shallow shelf environments which provides protection for shelf and slope habitats, as well as pinnacle and terrace sea floor features
- Sea floor habitats and communities of the Central Western Shelf Transition
- Three KEFs
- The Ningaloo Coast World Heritage Property, the Ningaloo Coast National Heritage listing and Ningaloo Marine Area Commonwealth Heritage Listing.

Commercial tourism and recreation (e.g. fishing) are important socio-economic values of the marine park (Director of National Parks 2018b).

### 12.3.4. Montebello Marine Park

The Montebello Marine Park is located offshore of Barrow Island and 80 km west of Dampier extending from the Western Australian state water boundary and is adjacent to the Western Australian Barrow Island and Montebello Islands Marine Parks. The Montebello Marine Park (Multiple Use Zone – IUCN Category VI) covers an area of approximately 3,413 km$^2$ and protects the following conservation values (Director of National Parks 2018b):

- Foraging areas for migratory seabirds that are adjacent to important breeding areas
- Areas used by vulnerable and migratory whale sharks for foraging
- Foraging areas marine turtles which are adjacent to important nesting sites
- Section of the north and south bound migratory pathway of the humpback whale
- Shallow shelf environments with depths ranging from 15–150 m which provides protection for shelf and slope habitats, as well as pinnacle and terrace sea floor features
- Sea floor habitats and communities of the Northwest Shelf Province provincial bioregions as well as the Pilbara (offshore) meso-scale bioregion
- One KEF for the region is the ancient Coastline (a unique sea floor feature that provides areas of enhanced biological productivity).

Commercial tourism, commercial fishing, mining and recreation are important socio-economic values for the park.

### 12.3.5. Dampier Marine Park

The Dampier Marine Park (Marine National Park Zone – IUCN Category I-73 km$^2$; Habitat Protection Zone – IUCN Category IV-104 km$^2$; Multiple Purpose Zone – IUCN Category VI-1,074 km$^2$) covers an area of approximately 1,252 km$^2$ and protects the following conservation values (Director of National Parks 2018b):

- Foraging areas for migratory seabirds that are adjacent to important breeding grounds
- Important foraging areas for marine turtles adjacent to significant nesting sites
- Part of the migratory pathway of the protected humpback whale
- Protection for offshore shelf habitats and shallow shelf habitats adjacent to the Dampier Archipelago
- Communities and sea floor habitats of the Northwest Shelf Province provincial bioregion as well as the Pilbara (nearshore) and Pilbara (offshore) meso-scale bioregions are included.

Port activities, commercial fishing and recreation (e.g. fishing) are important activities in the marine park (Director of National Parks 2018b). No heritage listings apply to the marine park.

### 12.3.6. Eighty Mile Beach Marine Park

The Eighty Mile Beach Marine Park (Multiple Use Zone – IUCN Category VI) is adjacent to the Western Australia Eighty Mile Beach Marine Park, 74 km north-east of Port Hedland and covers an area of approximately 10,785 km$^2$ and protects the following conservation values (Director of National Parks 2018b):

- Breeding, foraging and resting habitat for seabirds (one of the world's most important feeding grounds for migratory shorebirds and waders and is listed under the Ramsar Convention)
- Internesting and nesting habitat for marine turtles (it supports a significant nesting population of flatback turtles, which are endemic to northern Australia)
- Foraging, nursing and pupping habitat for sawfish
- Migratory pathway for humpback whales
- Coastal waters provide critical habitat for several shark and ray species at varying life stages
- Three known shipwrecks listed under the *Underwater Cultural Heritage Act 2018*: *Lorna Doone* (wrecked in 1923), *Nellie* (wrecked in 1908), and *Tifera* (wrecked in 1923).
- Tourism, commercial fishing, pearling and recreation are important activities in the Marine Park (Director of National Parks 2018b).

### 12.3.7. Argo-Rowley Terrace Marine Park

The Argo-Rowley Marine Park is located approximately 270 km north-west of Broome, Western Australia, and extends to the limit of Australia's exclusive economic zone. The Marine Park (Multiple Use Zone – IUCN Category VI-108,812 km$^2$; Marine National Park Zone – IUCN Category II-36,050 km$^2$; Special Purpose Zone – IUCN Category VI-1,141 km$^2$) covers an area of approximately 146,003 km$^2$ and protects the following conservation values (Director of National Parks 2018b):

- Foraging areas that are important for migratory seabirds as well as the endangered loggerhead turtle
- Important habitat and foraging for sharks
- Migratory pathway for pygmy blue whales (Director of National Parks 2018b)
- Protection for communities and habitats of the deeper offshore waters (220 m to over 5,000 m) of the region
- Sea floor features including aprons and fans, canyons, continental rise, knolls/abyssal hills and the terrace and continental slope
- Communities and sea floor habitats of the Northwest Transition and Timor Province provincial bioregions
- Connectivity between the existing Mermaid Reef Marine National Nature Reserve and reefs of the Western Australian Rowley Shoals Marine Park and the deeper waters of the region

- Two KEFs in the reserve include:
  - The canyons linking the Argo Abyssal Plain with the Scott Plateau (unique sea floor feature with enhanced productivity and feeding aggregations of species)
  - Mermaid Reef and the Commonwealth waters surrounding Rowley Shoals (an area of high biodiversity with enhanced productivity and feeding and breeding aggregations).

No heritage listings apply to this marine park (Director of National Parks 2018b). Commercial fishing and mining are important socio-economic values for the park.

### 12.3.8. Mermaid Reef Marine Park

The Mermaid Reef Marine Park (Multiple Use Zone – IUCN Category VI) lays approximately 280 km north-west of Broome, Western Australia, adjacent to the Argo–Rowley Terrace Marine Park and approximately 13 km from the Western Australian Rowley Shoals Marine Park. It covers an area of 540 km ² and protects the following conservation values (Director of National Parks 2018b):

- Mermaid Reef and Commonwealth waters surrounding Rowley Shoals are valued for its high productivity, aggregations of marine life and high species richness
- Mermaid Reef, Clerke Reef and Imperieuse Reef are biodiversity hotspot and key topographic feature of the Argo Abyssal Plain
- Rowley Shoals present some of the best geological examples of shelf atolls in Australian waters, and are ecologically significant in that they are considered ecological steppingstones for reef species originating in Indonesian/Western Pacific waters, are one of a few offshore reef systems on the north-west shelf, and may also provide an upstream source for recruitment to reefs further south
- Breeding habitat for seabirds
- Migratory pathway for the pygmy blue whale
- One known shipwreck listed under the *Underwater Cultural Heritage Act 2018*: Lively (wrecked in 1810).
- Tourism, recreation, and scientific research are important activities in the Marine Park (Director of National Parks 2018b).

### 12.3.9. Kimberley Marine Park

The Kimberley Marine Park (Multiple Use Zone – IUCN Category VI) is located approximately 100 km north of Broome, Western Australia, and extends from the Western Australian state water boundary north from the Lacepede Islands to the Holothuria Banks offshore from Cape Bougainville. It is adjacent to the Western Australian Lalanggarram / Camden Sound Marine Park and the North Kimberley Marine Park. It covers an area of 74,469 km², and protects the following conservation values (Director of National Parks 2018b):

- Northwest Shelf Province
  - Diverse benthic and pelagic fish communities
  - Ancient coastline thought to be an important sea floor feature
  - Migratory pathway for humpback whales
- Northwest Shelf Transition
  - High levels of species diversity
  - Endemism occur among demersal fish communities on the continental slope
- Timor Province
  - Reefs and islands of the bioregion are regarded as biodiversity hotspots
  - Endemism in demersal fish communities of the continental slope is high (two distinct communities have been identified on the upper and mid slopes)
  - Ancient coastline at the 125 m depth contour where rocky escarpments are thought to provide biologically important habitats in areas otherwise dominated by soft sediments

- Continental slope demersal fish communities characterised by high diversity of demersal fish assemblages
- Breeding and foraging habitat for seabirds
- Internesting and nesting habitat for marine turtles
- Breeding, calving and foraging habitat for inshore dolphins
- Calving, migratory pathway and nursing habitat for humpback whales
- Migratory pathway for pygmy blue whales
- Foraging habitat for dugong and whale sharks
- More than 40 known shipwrecks listed under the *Underwater Cultural Heritage Act 2018*.

Tourism, commercial fishing, mining, recreation, (e.g. fishing), and traditional use are important activities in the Marine Park (Director of National Parks 2018b).

**Table 20 Summary of marine network values, pressures, management programs and actions applicable to the EMBA**

| Marine network | Values | Pressures | Management programs and actions |
|---|---|---|---|
| South-west | • Nine bioregions<br>• Key ecological features<br>• EPBC listed species<br>• Biologically important areas<br>• Sea country indigenous values<br>• Historic shipwrecks<br>• Adjacent to Shark Bay World Heritage Area<br>• Shipping and port activities<br>• Commercial fishing<br>• Marine tourism | • Climate change<br>• Hydrological changes from coastal development and agriculture (increase sediment loads and pollutants)<br>• Illegal/unregulated/ unreported fishing<br>• Bycatch of non-target species<br>• Habitat modification from mining<br>• Human presence<br>• Invasive species<br>• Marine pollution | • Communication, education and awareness programs<br>• Promote suitable tourism experience<br>• Facilitate partnerships between tourism operators and Indigenous operators<br>• Indigenous engagement program<br>• Marine monitoring programs<br>• Park management via assessments / authorisation program for marine park activities<br>• Marine park management and development of suitable infrastructure<br>• Compliance planning and surveillance |
| North-west | • Eight bioregions<br>• Key ecological features<br>• EPBC listed species<br>• Biologically important areas<br>• Sea country indigenous values<br>• Native title determinations<br>• Traditional Indonesian fishers<br>• World Heritage Properties (Ningaloo Coast, Shark Bay)<br>• Ashmore Reef Marine Park and Eighty-Mile Beach Ramsar sites<br>• Shipping and port activities<br>• Commercial fishing, pearling, aquaculture<br>• Marine tourism<br>• Scientific research | • Climate change<br>• Hydrological changes from coastal development and agriculture (increase sediment loads and pollutants)<br>• Illegal/unregulated/ unreported fishing<br>• Bycatch of non-target species<br>• Habitat modification from mining<br>• Human presence<br>• Invasive species<br>• Marine pollution | • Communication, education and awareness programs<br>• Promote suitable tourism experience<br>• Facilitate partnerships between tourism operators and Indigenous operators<br>• Indigenous engagement program<br>• Marine monitoring programs<br>• Park management via assessments / authorisation program for marine park activities<br>• Marine Park management and development of suitable infrastructure<br>• Compliance planning and surveillance |

# 13. Conservation Management Plans

In order to protect, maintain and enhance recovery of certain threatened species and ecological communities the DAWE may prepare conservation management plans in the form of Conservation Advice or Recovery Plans.

## 13.1. Conservation Advice

When a native species or ecological community is listed as threatened under the EPBC Act, conservation advice is developed to assist its recovery. Conservation advice provides guidance on immediate recovery and threat abatement activities that can be undertaken to ensure the conservation of a newly listed species or ecological community.

## 13.2. Recovery Plans

The Australian Government Minister for the Environment may make or adopt and implement recovery plans for threatened fauna, threatened flora (other than conservation dependent species) and threatened ecological communities listed under the Commonwealth EPBC Act. Recovery plans set out the research and management actions necessary to stop the decline of, and support the recovery of, listed threatened species or threatened ecological communities. The aim of a recovery plan is to maximise the long-term survival in the wild of a threatened species or ecological community (DCCEEW, 2024c).

**Table 21: Summary of EPBC Act recovery plans applicable to the EMBA**

| Taxa | Common name | Recovery Plan / Conservation Advice | Threats |
|---|---|---|---|
| Birds | Australian lesser noddy | Approved Conservation Advice for *Anous tenuirostris melanops* (Australian lesser noddy) (2015) | Habitat modification by pied cormorants (Houtman Abrolhos) |
| | | | Catastrophic destruction of habitat by cyclones |
| | Migratory species within the EMBA:<br>• Bar-tailed godwit<br>• Common greenshank<br>• Common sandpiper<br>• Curlew Sandpiper<br>• Eastern Curlew<br>• Oriental plover<br>• Oriental pratincole<br>• Pectoral sandpiper<br>• Red knot<br>• Sharp-tailed sandpiper | Wildlife Conservation Plan for Migratory Shorebirds (2015) | Habitat loss and degradation |
| | | | Pollution and Contaminants |
| | | | Invasive species |
| | | | Anthropogenic disturbance |
| | | | Climate change and variability |
| | | | Overharvesting of shorebird prey |
| | | | Fisheries bycatch |
| | | | Direct mortality (hunting) |
| | Asian dowitcher | Conservation Advice for Asian dowitcher (2024)<br>Wildlife Conservation Plan for Migratory Shorebirds (2015) | Habitat loss, fragmentation and degradation |
| | | | Climate change |
| | | | Invasive species |
| | | | Exploitation |
| | | | Pollution |
| | Migratory and/or marine species within the EMBA<br>• Red-tailed tropicbird<br>• White-tailed tropicbird<br>• Wedge-tailed shearwater<br>• Flesh-footed shearwater<br>• Streaked shearwater<br>• Lesser frigatebird<br>• Great frigatebird<br>• Masked booby<br>• Red-footed booby<br>• Brown booby<br>• Common noddy<br>• Bridled tern<br>• Little tern<br>• Caspian tern<br>• Roseate tern<br>• Osprey | Wildlife Conservation Plan for Migratory Seabirds (2020) | Habitat loss and modification |
| | | | Climate variability and change |
| | | | Geological processes (volcanism, earthquake, tsunami and landslips) |
| | | | Invasive species |
| | | | Native wildlife |
| | | | Fisheries interactions and by-catch |
| | | | Prey depletion |
| | | | Resource extraction |
| | | | Renewable energy (collision/limited foraging) |
| | | | Anthropogenic disturbance |
| | | | Direct mortality (hunting) |
| | | | Transport |
| | | | Drones |
| | | | Pollution and contaminants |
| | | | Aquaculture |
| | | | Disease |
| | Red knot | Approved Conservation Advice for *Calidris canutus* (Red knot) (2024)<br>Wildlife Conservation Plan for Migratory Shorebirds (2015) | Habitat loss and habitat degradation |
| | | | Over-exploitation of shellfish |
| | | | Pollution/contamination impacts |
| | | | Disturbance |
| | | | Direct mortality (hunting) |
| | | | Diseases |
| | | | Extreme weather events |
| | | | Climate change impacts |
| | Curlew sandpiper | Approved Conservation Advice for *Calidris ferruginea* (Curlew Sandpiper) (2023) | Ongoing human disturbance |
| | | | Habitat loss, fragmentation and degradation |
| | | | Changes to the water regime |
| | | | Invasive plants |
| | | | Climate change impacts |
| | | | Climate change impacts |
| | Greater sand plover | Approved Conservation Advice for *Charadrius leschenaultii* (Greater sand plover) (2023)<br>Wildlife Conservation Plan for Migratory Shorebirds (2015) | Habitat loss, fragmentation and degradation |
| | | | Pollution/contamination impacts |
| | | | Anthropogenic disturbance |
| | | | Exploitation |
| | | | Climate change impacts |

| Taxa | Common name | Recovery Plan / Conservation Advice | Threats |
|---|---|---|---|
| | Amsterdam albatross | National RecoverP plan for albatrosses and petrels (2022) | Human disturbance |
| | | | Introduced invasive species |
| | | | Competition with native species |
| | | | Disease |
| | | | Geological processes |
| | | | Climate variability and change |
| | | | Fisheries interactions and bycatch |
| | | | Deliberate take |
| | | | Marine pollution |
| | | | Competition with fisheries for prey species |
| | | | Dependence on fisheries discards |
| | | | Marine infrastructure interactions |
| | Wandering albatross | National Recovery Plan for albatrosses and petrel (2022) | Human disturbance |
| | | | Introduced invasive species |
| | | | Competition with native species |
| | | | Disease |
| | | | Geological processes |
| | | | Climate variability and change |
| | | | Fisheries interactions and bycatch |
| | | | Deliberate take |
| | | | Marine pollution |
| | | | Competition with fisheries for prey species |
| | | | Dependence on fisheries discards |
| | | | Marine infrastructure interactions |
| | Northern Siberian bar-tailed godwit | Approved Conservation Advice for *Limosa lapponica menzbieri* (Yakutian bar-tailed Godwit) (2024) | Habitat loss, fragmentation and degradation |
| | | | Anthropogenic disturbance |
| | | | Pollution |
| | | | Exploitation |
| | | | Climate change |
| | Southern giant petrel | National Recovery Plan for albatrosses and petrels (2022) | Human disturbance |
| | | | Introduced invasive species |
| | | | Competition with native species |
| | | | Disease |
| | | | Geological processes |
| | | | Climate variability and change |
| | | | Fisheries interactions and bycatch |
| | | | Deliberate take |
| | | | Marine pollution |
| | | | Competition with fisheries for prey species |
| | | | Dependence on fisheries discards |
| | | | Marine infrastructure interactions |
| | Northern giant petrel | National Recovery Plan for albatrosses and petrels (2022) | Human disturbance |
| | | | Introduced invasive species |
| | | | Competition with native species |
| | | | Disease |
| | | | Geological processes |
| | | | Climate variability and change |
| | | | Fisheries interactions and bycatch |
| | | | Deliberate take |
| | | | Marine pollution |
| | | | Competition with fisheries for prey species |
| | | | Dependence on fisheries discards |

| Taxa | Common name | Recovery Plan / Conservation Advice | Threats |
|---|---|---|---|
| | | | Marine infrastructure interactions |
| | Eastern curlew | Approved Conservation Advice *for Numenius madagascariensis* (far eastern curlew) (2023) | Habitat loss, fragmentation and degradation |
| | | | Anthropogenic disturbance |
| | | | Pollution |
| | | | Exploitation |
| | | | Climate change |
| | Abbott's booby | Conservation Advice for the Abbott's booby *Papasula abbotti* (2020b) | Vegetation clearing – edge effects from previous clearing and new vegetation clearing |
| | | | Climate change – severe storm events and prey depletion |
| | | | Introduction of a new disease |
| | | | Invasive weeds |
| | | | Yellow crazy ants – habitat modification |
| | | | Fisheries – prey depletion |
| | | | Marine debris - plastics |
| | Christmas Island white-tailed tropicbird | Conservation Advice for *Phaethon lepturus fulvus* white-tailed tropicbird (Christmas Island) (2014) | Introduced predators on Christmas Island |
| | | | Crazy ants |
| | Soft-plumaged petrel | Approved Conservation Advice for *Pterodroma mollis* (soft-plumaged petrel) (2015) | Accidental introduction of predators (relevant only to Maatsuyker Island, located offshore of Tasmania) |
| | Australian painted snipe | Commonwealth Conservation Advice on *Rostratula australis* (Australian painted snipe) (2013) | Loss and degradation of wetlands, through drainage and the diversion of water for agriculture and reservoirs |
| | | | Grazing and associated trampling of wetland vegetation/nests, nutrient enrichment and disturbance to substrate by livestock |
| | | | Climate change |
| | | | Predation by feral animals |
| | | | Introduction of weeds |
| | Australian fairy tern | Commonwealth Conservation Advice on *Sternula nereis nereis* (fairy tern) (2011)<br><br>National Recovery Plan for the Australian Fairy Tern (*Sternula nereis nereis*) (2020) | Habitat degradation and loss of reproduction habitat |
| | | | Disturbance |
| | | | Invasive species |
| | | | Native wildlife |
| | | | Climate variability and change |
| | | | Water management and increased salinity |
| | | | Pollution |
| | | | Hybridisation |
| | Indian yellow-nosed albatross | National Recovery Plan for albatrosses and petrels (2022) | Human disturbance |
| | | | Introduced invasive species |
| | | | Competition with native species |
| | | | Disease |
| | | | Geological processes |
| | | | Climate variability and change |
| | | | Fisheries interactions and bycatch |
| | | | Deliberate take |
| | | | Marine pollution |
| | | | Competition with fisheries for prey species |
| | | | Dependence on fisheries discards |
| | | | Marine infrastructure interactions |
| | Shy albatross | Conservation Advice *Thalassarche cauta* Shy Albatross (2020c)<br>National Recovery Plan for albatrosses and petrels (2022) | Human disturbance |
| | | | Introduced invasive species |
| | | | Competition with native species |
| | | | Disease |
| | | | Geological processes |
| | | | Climate variability and change |
| | | | Fisheries interactions and bycatch |

| Taxa | Common name | Recovery Plan / Conservation Advice | Threats |
|---|---|---|---|
| | | | Deliberate take |
| | | | Marine pollution |
| | | | Competition with fisheries for prey species |
| | | | Dependence on fisheries discards |
| | | | Marine infrastructure interactions |
| | White-capped albatross | National Recovery Plan for albatrosses and petrels (2022) | Human disturbance |
| | | | Introduced invasive species |
| | | | Competition with native species |
| | | | Disease |
| | | | Geological processes |
| | | | Climate variability and change |
| | | | Fisheries interactions and bycatch |
| | | | Deliberate take |
| | | | Marine pollution |
| | | | Competition with fisheries for prey species |
| | | | Dependence on fisheries discards |
| | | | Marine infrastructure interactions |
| | Campbell albatross | National Recovery Plan for albatrosses and petrels (2022) | Human disturbance |
| | | | Introduced invasive species |
| | | | Competition with native species |
| | | | Disease |
| | | | Geological processes |
| | | | Climate variability and change |
| | | | Fisheries interactions and bycatch |
| | | | Deliberate take |
| | | | Marine pollution |
| | | | Competition with fisheries for prey species |
| | | | Dependence on fisheries discards |
| | | | Marine infrastructure interactions |
| | Black-browed albatross | National Recovery Plan for albatrosses and petrels (2022) | Human disturbance |
| | | | Introduced invasive species |
| | | | Competition with native species |
| | | | Disease |
| | | | Geological processes |
| | | | Climate variability and change |
| | | | Fisheries interactions and bycatch |
| | | | Deliberate take |
| | | | Marine pollution |
| | | | Competition with fisheries for prey species |
| | | | Dependence on fisheries discards |
| | | | Marine infrastructure interactions |
| Marine mammals | Sei whale | Approved Conservation Advice for *Balaenoptera borealis* (sei whale) (2015) | Climate and oceanographic variability and change |
| | | | Anthropogenic noise and acoustic disturbance |
| | | | Habitat degradation including pollution (increasing port expansion and coastal development) |
| | | | Pollution (persistent toxic pollutants) |
| | | | Vessel strike |
| | | | Prey depletion due to fisheries (potential threat) |
| | | | Resumption of commercial whaling (potential threat) |
| | Blue whale | Blue Whale Conservation Management Plan 2015 - 2025 (2015) | Whaling |
| | | | Climate Variability and Change |
| | | | Noise Interference |
| | | | Habitat Modification |

| Taxa | Common name | Recovery Plan / Conservation Advice | Threats |
|---|---|---|---|
| | | | Vessel Disturbance |
| | | | Overharvesting of prey |
| | Fin whale | Approved Conservation Advice for *Balaenoptera physalus* (fin whale) (2015) | Climate and oceanographic variability and change |
| | | | Anthropogenic noise and acoustic disturbance |
| | | | Habitat degradation including coastal development, port expansion and aquaculture |
| | | | Pollution (persistent toxic pollutants) |
| | | | Fisheries catch, entanglement and bycatch |
| | | | Vessel strike |
| | | | Resource depletion due to fisheries (potential threat) |
| | | | Resumption of commercial whaling (potential threat) |
| | Southern right whale | Conservation Management Plan for the Southern Right Whale 2011 – 2021 (2012)<br><br>Draft National Recovery Plan for the Southern Right Whale (*Eubalaena australis*) | Entanglement |
| | | | Vessel disturbance |
| | | | Whaling |
| | | | Climate variability and change |
| | | | Noise interference |
| | | | Habitat modification |
| | | | Overharvesting of prey |
| Marine reptiles | Short-nosed seasnake | Approved Conservation Advice on *Aipysurus apraefrontalis* (Short-nosed seasnake) (2011) | Degradation of reef habitat, primarily as a result of coral bleaching (primary threat) |
| | | | Oil and gas exploration |
| | | | Incidental catch and death in commercial prawn trawling fisheries |
| | Leaf-scaled seasnake | Approved Conservation Advice on *Aipysurus foliosquama* (Leaf-scaled seasnake) (2011) | Degradation of reef habitat, primarily as a result of coral bleaching (primary threat) |
| | | | Oil and gas exploration |
| | | | Incidental catch and death in commercial prawn trawling fisheries (north-west marine area) |
| | | | Unsustainable and illegal fishing practices (currently the most significant threat in the Ashmore region) |
| | Loggerhead turtle | Recovery Plan for Marine Turtles in Australia 2017 – 2027 (2017)<br>Loggerhead turtle – WA genetic stock | Fisheries bycatch – international (moderate), domestic (high) |
| | | | Indigenous take (moderate) |
| | | | Terrestrial predation (moderate) |
| | | | Habitat modification – infrastructure/coastal development (moderate), dredging/trawling (moderate) |
| | | | Chemical and terrestrial discharge – acute (high), chronic (low) |
| | | | Marine debris – entanglement and ingestion (moderate; unknown) |
| | | | Climate change and variability (high) |
| | | | International take – outside Australia's jurisdiction (moderate), within Australia's jurisdiction (low) |
| | | | Light pollution (moderate) |
| | | | Vessel disturbance (moderate) |
| | | | Noise interference – acute (moderate), chronic (moderate; unknown) |
| | | | Recreational activities (low) |
| | | | Diseases and pathogens (low; unknown) |
| | | | Fisheries bycatch – international (moderate), domestic (high) |
| | | | Cumulative impacts of threats |
| | Green turtle | Recovery Plan for Marine Turtles in Australia 2017 – 2027 (2017)<br>Green turtle – NWS genetic stock (NWS), Scott-Browse genetic stock (ScBr), Ashmore genetic stock (AR) | Fisheries bycatch – international (moderate), domestic (moderate) |
| | | | Indigenous take (moderate) |
| | | | Terrestrial predation NWS – moderate, AR –high; unknown, ScBr – moderate; unknown) |
| | | | Habitat modification – infrastructure/coastal development (NWS – moderate, AR – low, ScBr – high), |

| Taxa | Common name | Recovery Plan / Conservation Advice | Threats |
|---|---|---|---|
| | | | dredging/trawling (NWS – moderate, AR – low, ScBr – low) |
| | | | Chemical and terrestrial discharge – acute (NWS, AR, ScBr –high), chronic (NWS – moderate, AR – high, ScBr – high) |
| | | | Marine debris – entanglement (NWS – moderate, AR – very high, ScBr – moderate; unknown) and ingestion (NWS – low; unknown, AR – moderate, ScBr – moderate) |
| | | | Climate change and variability (NWS – moderate, AR – very high, ScBr – high) |
| | | | International take – outside Australia's jurisdiction (moderate; unknown for NWS and ScBr), within Australia's jurisdiction (moderate; unknown for NWS and ScBr) |
| | | | Light pollution (NWS – high, AR – moderate, ScBr – moderate) |
| | | | Vessel disturbance (moderate) |
| | | | Noise interference – acute (NWS – moderate; unknown, AR – low, ScBr – moderate), chronic (NWS – moderate; unknown, AR – low, ScBr – moderate; unknown) |
| | | | Recreational activities |
| | | | Diseases and pathogens (low; unknown for AR and ScBr) |
| | | | Cumulative impacts of threats |
| | Leatherback turtle | Approved Conservation Advice on *Dermochelys coriacea* (2008) | Incidental capture in commercial fisheries |
| | | | Harvest of eggs and meat |
| | | | Ingestion of marine debris |
| | | | Boat strike |
| | | | Predation on eggs by wild dogs, pigs and monitor lizards |
| | | | Degradation of foraging areas |
| | | | Changes to reproduction sites |
| | | Recovery Plan for Marine Turtles in Australia 2017 – 2027 (2017) | Fisheries bycatch – international (high), domestic (high) |
| | | | Indigenous take (low) |
| | | | Terrestrial predation (moderate; unknown) |
| | | | Habitat modification – infrastructure/coastal development (moderate), dredging/trawling (low) |
| | | | Chemical and terrestrial discharge – acute (low), chronic (low; unknown) |
| | | | Marine debris – entanglement (moderate) and ingestion (high) |
| | | | Climate change and variability (high) |
| | | | International take – outside Australia's jurisdiction (high), within Australia's jurisdiction (low) |
| | | | Light pollution (low) |
| | | | Vessel disturbance (moderate) |
| | | | Noise interference – acute (low; unknown), chronic (low; unknown) |
| | | | Recreational activities (low) |
| | | | Diseases and pathogens (low; unknown) |
| | | | Fisheries bycatch – international (high), domestic (high) |
| | | | Cumulative impacts of threats |
| | Hawksbill turtle | Recovery Plan for Marine Turtles in Australia 2017 – 2027 (2017)<br>Hawksbill turtle – WA genetic stock | Fisheries bycatch – international (moderate), domestic (moderate) |
| | | | Indigenous take (moderate) |
| | | | Terrestrial predation (moderate) |
| | | | Habitat modification – infrastructure/coastal development (moderate), dredging/trawling (moderate) |
| | | | Chemical and terrestrial discharge – acute (moderate), chronic (moderate) |
| | | | Marine debris – entanglement (moderate) and ingestion (low; unknown) |
| | | | Climate change and variability (high) |

| Taxa | Common name | Recovery Plan / Conservation Advice | Threats |
|---|---|---|---|
| | | | International take – outside Australia's jurisdiction (very high), within Australia's jurisdiction (moderate) |
| | | | Light pollution (high) |
| | | | Vessel disturbance (moderate) |
| | | | Noise interference – acute (moderate), chronic (moderate; unknown) |
| | | | Recreational activities (low) |
| | | | Diseases and pathogens (low; unknown) |
| | | | Cumulative impacts of threats |
| | Olive ridley turtle | Recovery Plan for Marine Turtles in Australia 2017 – 2027 (2017)<br>Olive ridley turtle – Northern Territory genetic stock | Fisheries bycatch – international (moderate), domestic (high) |
| | | | Indigenous take (moderate) |
| | | | Terrestrial predation (moderate; unknown) |
| | | | Habitat modification – infrastructure/coastal development (low), dredging/trawling (low) |
| | | | Chemical and terrestrial discharge – acute (high), chronic (moderate) |
| | | | Marine debris – entanglement (very high) and ingestion (moderate; unknown) |
| | | | Climate change and variability (very high) |
| | | | International take – outside Australia's jurisdiction (moderate), within Australia's jurisdiction (moderate) |
| | | | Light pollution (moderate) |
| | | | Vessel disturbance (moderate) |
| | | | Noise interference – acute (low), chronic (low; unknown) |
| | | | Recreational activities (low) |
| | | | Diseases and pathogens (low; unknown) |
| | | | Cumulative impacts of threats |
| | Flatback turtle | Recovery Plan for Marine Turtles in Australia 2017 – 2027 (2017)<br>Flatback turtle – Pilbara coast genetic stock (Pil), South-west Kimberley coast genetic stock (swKim) and Cape Domett (CD) | Fisheries bycatch – international (low), domestic (moderate) |
| | | | Indigenous take (moderate) |
| | | | Terrestrial predation (moderate) |
| | | | Habitat modification – infrastructure/coastal development (Pil – high, swKim – moderate), dredging/trawling (moderate) |
| | | | Chemical and terrestrial discharge – acute (high), chronic (moderate) |
| | | | Marine debris – entanglement (moderate) and ingestion (low) |
| | | | Climate change and variability (Pil – high, swKim – moderate) |
| | | | International take – outside Australia's jurisdiction (low), within Australia's jurisdiction (low) |
| | | | Light pollution (Pil – high, swKim – moderate) |
| | | | Vessel disturbance (moderate) |
| | | | Noise interference – acute (moderate), chronic (moderate; unknown) |
| | | | Recreational activities (Pil – low, swKim – moderate) |
| | | | Diseases and pathogens (low; unknown) |
| | | | Cumulative impacts of threats |
| Fish and sharks | Grey nurse shark | Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (2014) | Mortality due to incidental capture by commercial and recreational fisheries |
| | | | Mortality die to shark control programs |
| | | | Ecotourism |
| | | | Public aquarium trade |
| | | | Pollution and disease |
| | | | Ecosystem effects - habitat modification and climate change |

| Taxa | Common name | Recovery Plan / Conservation Advice | Threats |
|---|---|---|---|
| | Great white shark | Recovery plan for the White Shark (*Carcharodon carcharias*) (2013) | Mortality related to being caught accidentally (bycatch) or illegally (targeted) by commercial and recreational fisheries, including issues of post release mortality |
| | | | Mortality related to shark control activities such as beach meshing or drumlining (east coast population) |
| | | | Illegal trade in white shark products |
| | | | Ecosystem effects as a result of habitat modification and climate change |
| | | | Ecotourism |
| | Northern river shark | Approved Conservation Advice for *Glyphis garricki* (northern river shark) (2014) | Commercial fishing activities |
| | | | Recreational fishing |
| | | | Indigenous fishing |
| | | | Illegal, unreported and unregulated fishing |
| | | | Habitat degradation and modification |
| | | | Marine debris |
| | | | Collection of animals for display in public aquaria (no known occurrences to date) |
| | | Sawfish and River Sharks Multispecies Recovery Plan (2015) | Fishing activities including being caught as by-catch in the commercial and recreational sectors; through indigenous fishing; and illegal, unreported and unregulated fishing |
| | | | Habitat degradation and modification |
| | Dwarf sawfish | Approved Conservation Advice on *Pristis clavata* (dwarf sawfish) (2009) | Being caught as bycatch in commercial and recreational net fishing |
| | | | Illegal, unreported and unregulated fishing |
| | | | Habitat degradation due to increasing human development |
| | | Sawfish and River Sharks Multispecies Recovery Plan (2015) | Fishing activities including being caught as by-catch in the commercial and recreational sectors; through indigenous fishing; and illegal, unreported and unregulated fishing |
| | | | Habitat degradation and modification |
| | Freshwater sawfish | Approved Conservation Advice for *Pristis pristis* (largetooth sawfish) (2014) | Commercial fishing activities |
| | | | Recreational fishing |
| | | | Indigenous fishing |
| | | | Illegal, unreported and unregulated fishing |
| | | | Habitat degradation and modification |
| | | | Marine debris |
| | | | Collection of animals for display in public aquaria |
| | | Sawfish and River Sharks Multispecies Recovery Plan (2015) | Fishing activities including being caught as by-catch in the commercial and recreational sectors; through indigenous fishing; and illegal, unreported and unregulated fishing |
| | | | Habitat degradation and modification |
| | Green sawfish | Approved Conservation Advice for *Pristis zijsron* (green sawfish) (2008) | Capture as bycatch and byproduct in gillnet and trawl fisheries |
| | | | Illegal capture for fins and rostra |
| | | | Habitat degradation through coastal development |
| | | Sawfish and River Sharks Multispecies Recovery Plan (2015) | Fishing activities including being caught as by-catch in the commercial and recreational sectors; through indigenous fishing; and illegal, unreported and unregulated fishing |
| | | | Habitat degradation and modification |
| | Whale shark | Approved Conservation Advice for *Rhincodon typus* (whale shark) (2015) | Intentional and unintentional mortality from fishing outside of Australian waters |
| | | | Boat strike from large vessels |
| | | | Habitat disruption from mineral exploration, production and transportation |
| | | | Disturbance from domestic tourism operations |
| | | | Marine debris |
| | | | Climate change |

# 14. Social and Economic Features

## 14.1. Industry

The area of the NWS is a major oil and gas hub in Australia, with several companies operating on the Shelf. The activity occurs in a particularly isolated area of the NWS with respect to the main oil and gas operational and exploratory fields. There are currently no operating fields in the OAs. The proposed Santos Dorado development overlaps the Dorado OA and it there is the potential for the appraisal drilling under this EP to occur concurrent to the development activities detailed within the Santos Dorado Offshore Project Proposal (Santos, 2021) and associated EPs.

## 14.2. Other Infrastructure

The Jasuraus submarine communication cable links Australia with Indonesia. The cable was installed as a link from Australia to provide telephone services connection to the world in 1995-1996. Travelling north out of Port Hedland for approximately 210 km the cable then heads north-west toward Jakarta, Indonesia. The cable runs up through Permit Areas WA-435-P and WA437-P. Its capacity and major role was overtaken in 2000 by other subsea cables out of Australia. However, Telstra continues to manage the cable as it remains an emergency backup link out of Australia. The cable includes two submerged repeaters in the wider region.

## 14.3. Shipping

The Western Australian coastline supports twelve ports including the major ports of Dampier, Port Hedland and Broome which are operated by their respective port authorities. Large cargo vessels move through the region to and from Fremantle, transiting along coastline. Commercial shipping also moves to and from marine terminals associated with the oil and gas industry (see **Section 14.1**). Other large ports include Geraldton, Busselton, Albany and Esperance. Closer proximity shipping also includes construction vessels/barges/dredges, domestic support vessels, and offshore survey vessels.

The Australian Maritime Safety Authority (AMSA) has established a network of shipping fairways off the north-west coast of Australia to manage traffic patterns (AMSA 2013). The Shipping Fairways are designed to keep shipping traffic away from offshore infrastructure and aims to reduce the risk of collision (AMSA 2013).

Use of the fairways is strongly recommended but not mandatory. The International Regulations for *Preventing Collisions at Sea 1972* apply to all vessels navigating within or outside the shipping fairways. The use of these fairways does not give vessels any special right of way (AMSA 2012).

Under the *Commonwealth Navigation Act 2012*, certain vessels operating in Australian waters are required to report their location on a daily basis to the Rescue Coordination Centre (RCC) in Canberra. This Australian Ship Reporting System (AUSREP) is an integral part of the Australian Maritime Search and Rescue system and is operated by AMSA through the RCC. Vessels recorded in waters in the EMBA through the AUSREP system in 2023 are shown in **Figure 17**.

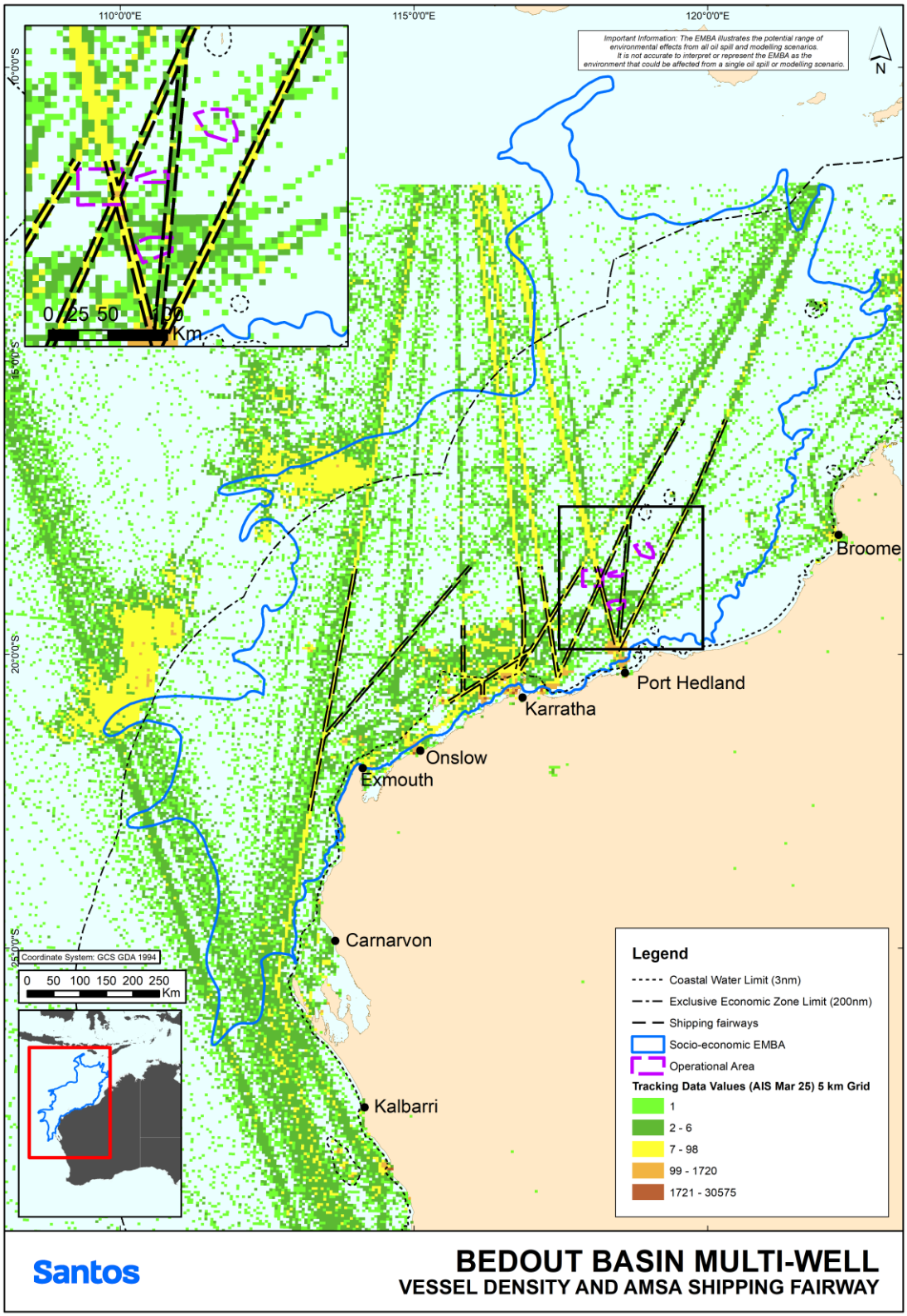



**Figure 17: AMSA ship locations and shipping routes**

## 14.4. Defence Activities

Key defence bases and facilities are illustrated in **Figure** 18.

The Naval Communication Station Harold E. Holt is located on the northwest coast of Australia, 6 km north of Exmouth. The town of Exmouth was built at the same time as the communications station to provide support to the base and to house dependent families of US Navy personnel (Shire of Exmouth 2018, DoE 2014).

The station provides very low frequency radio transmission to US Navy and Royal Australian Navy ships and submarines in the western Pacific Ocean and eastern Indian Ocean. With a transmission power of 1 megawatt, it is the most powerful transmission station in the southern hemisphere (Shire of Exmouth 2018, DoE 2014).

Two Royal Australian Airforce (RAAF) bases are located in the northwest of WA; Learmonth RAAF Base, near Exmouth and Curtin RAAF Base near Derby (RAAF 2014).

Designated military exercise areas occur over waters and airspace of the north west of WA and may be activated following the required notifications.

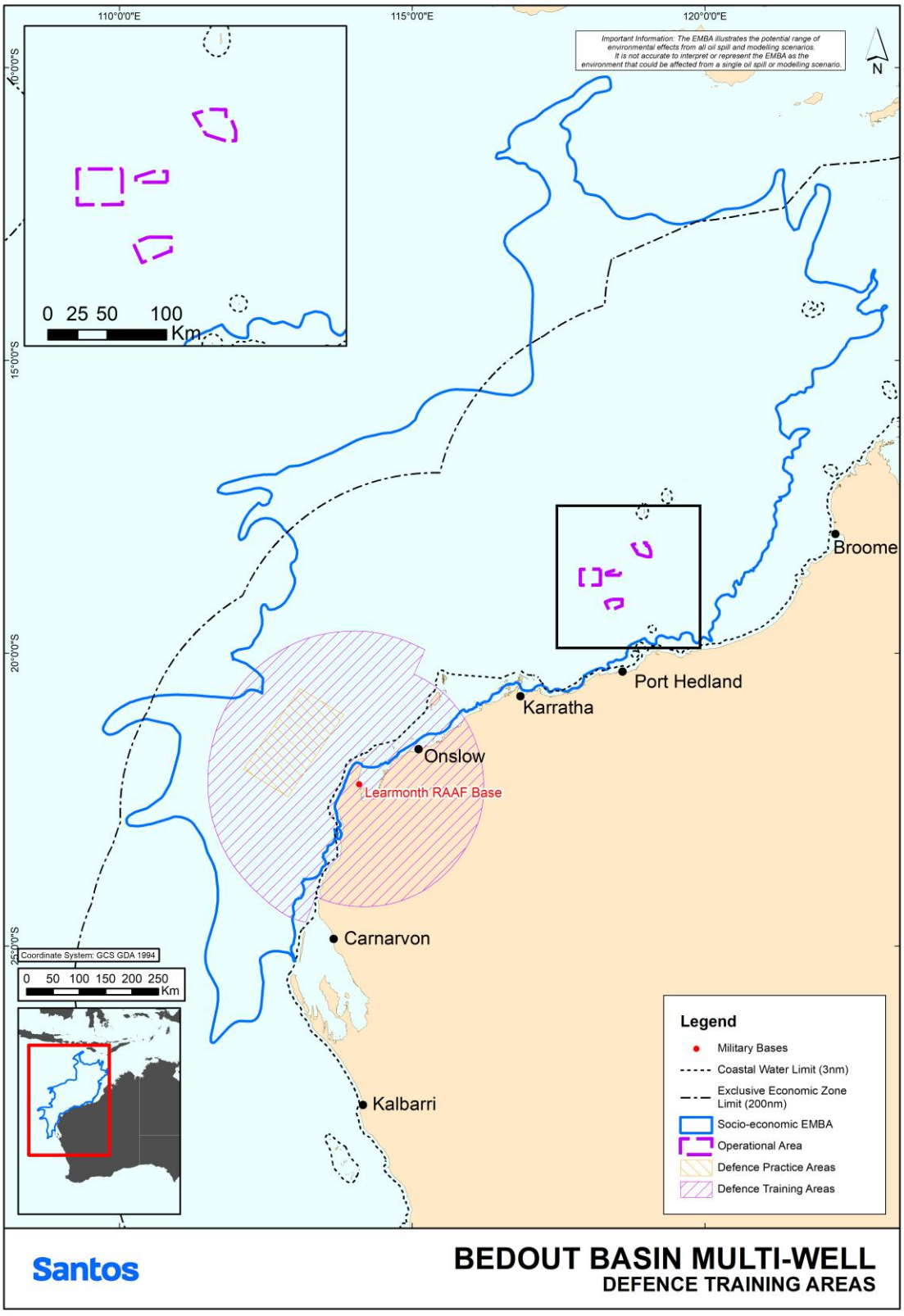



**Figure 18: Defence activities**

## 14.5. Tourism

The Kimberley, Pilbara and Gascoyne regions are popular visitor destination for Australian and international tourists. Tourism is concentrated in the vicinity of population centres including Broome, Dampier, Exmouth, Coral Bay and Shark Bay.

Marine and coastal use is also clustered around major population centres along the WA coastline including Perth, Bunbury, Geraldton, Margaret River, Jurien Bay, Augusta and Albany.

Marine tourism to offshore Islands includes various Pilbara nearshore Islands (Muiron, Serrurier, Sholl and Montebello) and the Abrolhos Islands near Geraldton. Currently visitation to the Abrolhos is low because the park is only accessible via recreational boat, charter flight or commercial tour (either on a boat or aircraft); however, there is an increasing number of visitors, with visitations peaking between February and May (DBCA, 2022). The Montebello Islands are ranked among the world's most bio-diverse marine environments (DBCA) and are attracting a growing number of nature-based tourism operators, with people participating in activities such as fishing, diving, wildlife viewing, island exploration and surfing (DEC 2007).

Tourism contributes to local economies in terms of both income and employment and tourists include local, interstate and international visitors. Popular water-based activities include fishing, swimming, snorkelling/ diving, surfing/windsurfing/kiting and boating, while popular land-based activities include bushwalking, camping, bird watching and four-wheel driving.

Seasonal nature-based tourism such as humpback whale watching, whale shark encounters and tours of turtle hatching mainly occurring around Ningaloo Reef, Cape Range National Park, Broome and Perth (Tourism Western Australia 2014). Seasonal aggregations of whale sharks, manta rays, sea turtles and whales, as well as the annual mass spawning of coral attract large numbers of visitors to Ningaloo each year (CALM 2005).

## 14.6. Maritime Heritage

Shipwreck data from the Australasian Underwater Cultural Heritage Database (DCCEWW, 2024j) identified 17 shipwrecks located within the EMBA. Under the Commonwealth Underwater Culture Heritage Act 2018 all shipwrecks older than 75 years are protected, while those dated pre-1900 are protected by WA law under the Maritime Archaeology Act 1973.

## 14.7. Commercial Fisheries

A valuable and diverse commercial fishing industry is supported by both the offshore and coastal waters in the North Coast, Gascoyne, West Coast and South Coast Bioregions between the WA and NT and South Australian borders. The major fisheries in this area target tropical finfish, large pelagic fish species, crustaceans (prawns and scampi), Western Rock Lobster and pearl oysters (Fletcher and Santoro 2013). A number of smaller fisheries also exist in this area including the octopus and beche-de-mer fisheries.

### 14.7.1. State Fisheries

State fisheries are managed by the WA Department of Primary Industries and Regional Development (DPIRD) (formerly Department of Fisheries (DoF)) with specific management plans, regulations and a variety of subsidiary regulatory instruments under the *Fish Resources Management Act 1994* (WA). The information on State managed fisheries has been derived from '*The State of the Fisheries'* Report 20 (Newman et al. 2023) and direct consultation with DPIRD. Santos consults regularly with State fisheries relevant to activity operational areas, mainly by distribution of an Annual Consultation Update by post (as well as conducting further consultation in preparing an EP under s 25 of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023.

State commercial fisheries within the EMBA are shown in **Figure 19** to **Figure 21**. A summary of all commercial fisheries wholly or partially operating in the EMBA is also provided in **Table 22**. These are:

**North Coast Bioregion**

- Onslow Prawn Managed Fishery (OPMF)
- Nickol Bay Prawn Managed Fishery (NBPMF)
- Pilbara Demersal Scalefish Fisheries
- Pilbara Developing Crab Fishery
- Pilbara Fish Trawl (Interim) Managed Fishery (PFTIMF)
- Pilbara Trap Managed Fishery (PTMF)
- Pilbara Line Fishery
- Western Australian Sea Cucumber Fishery
- Western Australian Pearl Oyster Fishery

**Gascoyne Bioregion**

- Exmouth Gulf Prawn Managed Fishery
- Gascoyne Demersal Scalefish Managed Fishery
- Shark Bay Scallop Managed Fishery
- Shark Bay Prawn Managed Fishery
- Shark Bay Crab Interim Managed Fishery

**Whole of State Fisheries**

- Marine Aquarium Fish Managed Fishery (MAFMF)
- Specimen Shell Managed Fishery
- Mackerel Managed Fishery
- West Coast Deep Sea Crustacean Managed Fishery
- Abalone Managed Fishery
- South-West Coast Salmon Fishery

Some of the fisheries listed above will be more susceptible to impacts than others, particularly fisheries without the ability to escape impacts. For example, above average water temperatures over the last three years will have

had an impact on prawn fisheries in Exmouth and scallops and blue swimmer crabs in Shark Bay which have been significantly affected by the initial heat wave event of 2010/11 (Caputi et al. 2014).

### 14.7.2. Commonwealth Fisheries

Commonwealth fisheries are those within the 200 nautical mile Australian Fishing Zone (AFZ) managed by Australian Fisheries Management Authority (AFMA) and are, on the high seas, and, in some cases, by agreement with the States and Territory, to the low water mark. Information on Commonwealth managed fisheries has been derived from '*Fishery Status'* Report 2019 (Department of Agriculture 2019)

Commonwealth fisheries who have permits to operate in the EMBA include as shown in Figure 22:

- North West Slope Trawl (NWST)
- Southern Bluefin Tuna Fishery (SBFTF)
- Western Tuna and Billfish Fishery (WTBF) (including Southern Tuna and Billfish Fishery)
- Skipjack Tuna Fishery (STF)
- Western Deepwater Trawl (WDTF).

Commonwealth commercial fisheries between Kalbarri (WA) and the NT Border are shown **Figure 22** and summarised in **Table 22**

### 14.7.3. Indonesian Commercial and Subsistence Fishing

Within the northern and north-western extent of the EMBA is a defined area where a Memorandum of Understanding (MoU) exists between the Australian and Indonesian Governments. The Agreement between the Government of Australia and the Government of the Republic of Indonesia Relating to Cooperation in Fisheries (1992 Fisheries Cooperation Agreement) provides the framework for fisheries and marine cooperation between Australia and Indonesia, and facilitates information exchange on research, management and technological developments, complementary management of shared stocks, training and technical exchanges, aquaculture development, trade promotion and cooperation to deter illegal fishing.

Cooperation under the Agreement today takes place under the auspices of the Working Group on Marine Affairs and Fisheries. Established in 2001, the Working Group on Marine Affairs and Fisheries is the primary bilateral forum to enhance collaboration across the spectrum of marine and fisheries issues relevant to the areas of the Arafura and Timor seas. The Working Group brings together the fisheries, environment and scientific research portfolios and agencies from both countries.

The MoU Box (shown on **Figure 22**) is an area of Australian water in the Timor Sea where Indonesian traditional fishers, using traditional fishing methods only, are permitted to operate. Officially it is known as the Australia-Indonesia Memorandum of Understanding regarding the Operations of Indonesian Traditional Fishermen in Areas of the Australian Fishing Zone and Continental Shelf – 1974.

As part of negotiations to delineate seabed boundaries, Australia and Indonesia entered into the MoU which recognises the rights of access for traditional Indonesian fishers in shared waters to the north of Australia. This access was granted in recognition of the long history of traditional Indonesian fishing in the area. The MoU provides Australia with a tool to manage access to its waters while for Indonesia, it enables Indonesian traditional fishers to continue their customary practices and target species such as trepang, trochus, abalone and sponges. Guidelines under the MoU were agreed in 1989 in order to clarify access boundaries for traditional fishers and take into account the declaration of the 200 nautical mile fishing zones. Because of its approximate shape the MoU area became known as the MoU Box.

Between 2006 and 2008, a series of surveys were undertaken to understand the traditional practice of Indonesian fishers that journey to Scott Reef within the MoU boundary (ERM 2008, 2009). The majority of perahu (vessels) that travel to Scott Reef originate from the islands of Rote (near West Timor) and Tonduk and Raas (in East Java). Some crew from the Rote perahus are recruited from the region of Alor (one of the Lesser Sundas chain, located north of East Timor and east of Bali). In 2007, an estimated 800 fishers (approximately 80 vessels) travelled from these home islands to Scott Reef, mainly to collect trepang. Similar vessel numbers sailed to Scott Reef in 2008.

Journeys to Scott Reef are generally restricted to drier months when wind speeds and directions are more desirable. Most Indonesian fishers travel to Scott Reef during July to October, although a few Rotenese make the

journey to Scott Reef in the early season between April and June. Other fishers plan to go after Aidil Fitri, a religious holiday widely celebrated on Tonduk Island that celebrates the end of Ramadan.

The fishers focus their activities in and around the shallow water lagoons of Scott Reef primarily targeting trepang; and opportunistically gather trochus shells. They also catch fish largely for subsistence purposes although the average fish catch per lete-lete (traditional Indonesian fishing vessel) in 2008 increased to commercial volumes. Although deeper waters are more plentiful in trepang, deep diving is generally not undertaken by the fishers due to the MoU stipulation on the exclusive use of traditional equipment only (Woodside Energy Limited 2011).

**Table 22: Commercial fisheries with permits to operate within the EMBA**

| Fishery | Target Species | Catch[1] | Fishing Method | Area Description |
|---|---|---|---|---|
| **State Managed Fisheries** | | | | |
| Exmouth Gulf Prawn Managed Fishery | Western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*Penaeus esculentus*), endeavour prawns (*Metapenaeus* spp.) and banana prawns (*Penaeus merguiensis*). | 2017/2018: 713 tonnes<br>2022/2023:<br>Commercial: 898t | Low opening otter trawls. | Sheltered waters of Exmouth Gulf Essentially the western half of the Exmouth Gulf (eastern part is a nursery ground). The Muiron Islands and Point Murat provide the western boundary; Serrurier Island provides the northern limit<br>Partially within the EMBA |
| Gascoyne Demersal Scalefish Managed Fishery (GDSMF) | Targets pink snapper (*Pagrus auratus*) and goldband snapper (*Pristipomoides multidens*).<br>Other demersal species caught include the rosy snapper (*P. filamentosus*), ruby snapper *(Etelis carbunculus*), red emperor (*Lutjanus sebae*), emperors (*Lethrinidae*, including spangled emperor, *Lethrinus nebulosus*, and redthroat emperor, *L. miniatus*), cods (*Epinephelidae*, including Rankin cod, *Epinephelus multinotatus* and goldspotted rockcod, *E. coioides*), pearl perch (*Glaucosoma burgeri)*, mulloway (*Argyrosomus japonicas*), amberjack (*Seriola dumerili)* and trevallies (*Carangidae*). | 2017/2018: Snapper: 133 tonnes<br>Other demersals: 144 tonnes<br>2022/2023:<br>Commercial: 166.3t<br>Recreational: 79-117t | Mechanised handlines | The GDSF operates in the waters of the Indian Ocean and Shark Bay between latitudes 23°07’30”S and 26°30’S. Vessels are not permitted to fish in inner Shark Bay.<br>Partially within the EMBA |
| Abalone Managed Fishery | Greenlip abalone (*Haliotis laevigata*)<br>Brownlip abalone (*H. conicopora*) | 2017/2018: 98 tonnes<br>2022/2023:<br>Commercial: 40.1t | Dive fishery<br>The principal harvest method is a diver working off | Shallow coastal waters off the south-west and south coasts of Western Australia<br>Covers all Western Australian coastal waters, which are divided into eight management areas. Commercial fishing for |

| Fishery | Target Species | Catch[1] | Fishing Method | Area Description |
|---|---|---|---|---|
| | | Recreational: 11.6-17.2t | 'hookah' (surface supplied breathing apparatus) or SCUBA using an abalone 'iron' to prise the shellfish off rocks – both commercial and recreational divers employ this method. | greenlip/brownlip abalone is managed in three separate areas.<br>Partially within the EMBA |
| Marine Aquarium Fish Managed Fishery (MAFMF) | Over 250 target species of finfish. (228 species caught in 2012).<br>Fishers can also take coral, live rock, algae, seagrass and invertebrates.<br>The main fish species landed in 2012 were scribbled angelfish (*Chaetodontoplus duboulayi*) and green chromis (*Chromis cinerascens*)<br>The main coral species landed in 2012 were the coral like anemones of the *Corallimorpharia*. | 2017/2018: Total catch of 150,544 fishes, 21.9 t of coral, live rock & living sand and 322 L of marine plants.<br>2022:<br>Commercial: total catch 19,710 individuals (fish)<br>77,287 invertebrates | Hand harvest while diving or wading. Hand held nets | Dive based fishery operating all year throughout WA waters but restricted by diving depths.<br>The MAFMF is able to operate in all State waters (between the Northern Territory border and South Australian border). The fishery is typically more active in waters south of Broome with higher levels of effort around the Capes region, Perth, Geraldton, Exmouth and Dampier. Operators in the MAFMF are also permitted to take coral, live rock, algae, seagrass and invertebrates under the Prohibition on Fishing (Coral, 'Live Rock' and Algae) Order 2007 and by way of Ministerial Exemption (Gaughan & Santoro, 2018).<br>Partially within the EMBA |
| Nickol Bay Prawn Managed Fishery (NBPMF) | Primarily targets banana prawns (*Penaeus merguiensis*) | 2017/2018: 227 t<br>2022/2023:<br>Commercial: 51 t | Otter trawl | Operates along the western part of the North-West Shelf in coastal shallow waters<br>The boundaries of the NBPMF are 'all the waters of the Indian Ocean and Nickol Bay between 116°45' east longitude and 120° east longitude on the landward side of the 200 m isobath'. The NBPMF incorporates the Nickol Bay, Extended Nickol Bay, Depuch and De Grey size managed fish grounds (State of the Fisheries 2014-15). |

| Fishery | Target Species | Catch[1] | Fishing Method | Area Description |
|---|---|---|---|---|
| | | | | Wholly within the EMBA |
| Onslow Prawn Managed Fishery (OPMF) | Western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*Penaeus esculentus*), endeavour prawns (*Metapenaeus* spp.) | 2017/2018: Negligible (Minimal fishing occurred in 2017)<br>2022/2023:<br>Commercial: <60 t | Otter trawl | Operates along the western part of the North-West Shelf with most prawning activities concentrated in the shallower water off the mainland.<br>The boundaries of the OPMF are 'all the Western Australian waters between the Exmouth Prawn Fishery and the Nickol Bay prawn fishery east of 114º39.9' on the landward side of the 200 m depth isobath'.<br>Wholly within the EMBA |
| Pilbara Developmental Crab Fishery | Blue Swimmer (*Portunus armatus*)<br>Mud Crab (*Scylla* spp) | 2017/2018: 60 t (total number includes Kimberley Developing Mud Crab Fishery)<br><br>2022/2023: unspecified | Variety of gear but mostly commercial crab pots (Hourglass traps used in inshore waters from Onslow through to Port Hedland with most commercial and activity occurring in and around Nickol Bay)<br>Recreational fishers use drop nets or scoop nets, with diving for crabs becoming increasingly popular | The majority of the commercially and recreationally-fished stocks are concentrated in the coastal embayments and estuaries between Geographe Bay in the south west and Nickol Bay in the north. Crabbing activity along the Pilbara coast is centred largely on the inshore waters from Onslow through to Port Hedland, with most commercial and recreational activity occurring in and around Nickol Bay.<br>Partially within the EMBA |
| Pilbara Fish Trawl (Interim) Managed Fishery (PFTIMF) | Variety of demersal scalefish including goldband snapper (*Pristipomoides multidens*), red emperor (*Lutjanus sebae*), bluespotted emperor (*Lethrinus punctulatus*), crimson snapper (*Lutjanus erythropterus*), saddletail snapper (*Lutjanus malabaricus*), Rankin cod | 2017/2018: 1,780 t<br>2022/2023:<br>Commercial: 1784 t | Demersal trawl | The Pilbara Fish Trawl (Interim) Managed Fishery is situated in the Pilbara region in the north west of Australia. It occupies the waters north of latitude 21°35'S and between longitudes 114°9'36"E and 120°E. The Fishery is seaward of the 50 m isobath and landward of the 200 m isobath. |

| Fishery | Target Species | Catch[1] | Fishing Method | Area Description |
|---|---|---|---|---|
| | (*Epinephelus multinotatus*), brownstripe snapper (*Lutjanus vitta*), rosy threadfin bream (*Nemipterus furcosus*), spangled emperor (L*ethrinus nebulosus*) and frypan Moses' snapper (*Argyrops lutjanusspinifer russelli*). | | | The Fishery consists of two zones; Zone 1 in the south west of the Fishery (which is closed to trawling) and Zone 2 in the North, which consists of six management areas.<br>Wholly within the EMBA |
| Pilbara Trap Managed Fishery (PTMF) | Blue-spot emperor (*Lethrinus hutchinsi*), Red snapper (*Lutjanus erythropterus)*,<br>Goldband snapper (*Pristipomoides multidens*), Scarlet perch (*Lutjanus malabaricus)*,<br>Red emperor (*Lutjanus sebae*),<br>Spangled emperor (*Lethrinus nebulosus*),<br>Rankin cod (*Epinephelus multinotatus*) | 2017/2018: 400–600 t<br>2022/2023: Commercial: 597 t | Use of rectangular traps with single opening and 50 mm x 70 mm rectangular mesh panels. Trap fishing normally targets areas around rocky outcrops and reefs | Permitted to operate within waters bounded by a line commencing at the intersection of 21°56´ S latitude and the high-water mark on the western side of the North West Cape.<br>Wholly within the EMBA |
| Pilbara Line Managed Fishery | Variety of demersal scalefish including goldband snapper (*Pristipomoides multidens)*, red emperor *(Lutjanus sebae)*, bluespotted emperor (*Lethrinus punctulatus*), crimson snapper *(Lutjanus erythropterus*), saddletail snapper (*Lutjanus malabaricus)*, Rankin cod (*Epinephelus multinotatus*), brownstripe snapper (*Lutjanus vitta*), rosy threadfin bream (*Nemipterus furcosus*), spangled emperor (*Lethrinus nebulosus*) and frypan snapper (*Argyrops spinifer*), Ruby snapper (*Etelis carbunculus*) and eightbar grouper (*Hyporthodus octofasciatus*) | 2017/2018: 50–115 t<br>2022/2023: Commercial: 104 t | Line | The Pilbara Trap Managed Fishery lies north of latitude 21°44´ S and between longitudes 114°9´36´´ E and 120° E on the landward side of a boundary approximating the 200 m isobath and seaward of a line generally following the 30 m isobath.<br>Wholly within the EMBA |

| Fishery | Target Species | Catch[1] | Fishing Method | Area Description |
|---|---|---|---|---|
| Shark Bay Crab Interim Managed Fishery | Blue swimmer crab (*Portunus armatus*) | 2017/2018: 443 t total<br>Crab: 153 t<br>2022/2023:<br>Commercial: 401 t<br>Recreational: 1-4 t | Trawl and trap | Waters of Shark Bay north of Cape Inscription, to Bernier and Dorre Islands and Quobba Point.<br>In addition, two fishers with long-standing histories of trapping crabs in Shark Bay are permitted to fish in the waters of Shark Bay south of Cape Inscription.<br>Partially within the EMBA |
| Shark Bay Prawn Managed Fishery | Western king prawn (*Penaeus latisulcatus*), brown tiger prawn (*Penaeus esculentus*), Variety of smaller prawn species including endeavour prawns (*Metapenaeus* spp.) and coral prawns (various species). | 2017/2018: 1,608 t<br>2022/2023:<br>Commercial: 831 t | Low opening otter trawls | The boundaries of the Shark Bay Prawn Managed Fishery are located in and near the waters of Shark Bay<br>Partially within the EMBA |
| Shark Bay Scallop Managed Fishery | Saucer scallop (*Ylistrum balloti*) | 2017/2018: 1,632 t<br>2022/2023:<br>Commercial: 177 t | Low opening otter trawls | The boundaries of the Shark Bay Scallop Managed Fishery are located in and near the waters of Shark Bay<br>Partially within the EMBA |
| Specimen Shell Managed Fishery (SSF) | Shells (cowries, cones)<br>The Specimen Shell Managed Fishery (SSF) is based on the collection of individual shells for the purposes of display, collection, cataloguing, classification and sale. Just under 200 (196) different Specimen Shell species were collected in 2012, using a variety of methods. | 2017/2018: 7,806 shells<br>2022/2023: 5,074 shells | Hand harvest while diving or wading along coastal beaches below the high-water mark<br>An exemption method being employed by the fishery is using a remote-controlled underwater vehicle at depths between 60 and 300 m. | Dive based fishery operating all year throughout WA waters but restricted by diving depths.<br>The fishing area includes all Western Australian waters between the high-water mark and the 200 m isobath.<br>While the fishery covers the entire WA coastline, there is some concentration of effort in areas adjacent to population centres such as Broome, Karratha, Exmouth, Shark Bay, metropolitan Perth, Mandurah, the Capes area and Albany.<br>Partially within the EMBA |
| South West Coast Salmon | WA salmon (*Arripis truttaceus*) | Insufficient information | Insufficient information | Insufficient information<br>Various beaches south of the metropolitan area.<br>Partially within the EMBA |

| Fishery | Target Species | Catch[1] | Fishing Method | Area Description |
|---|---|---|---|---|
| Managed Fishery | | | | |
| West Coast Deep Sea Crustacean (Interim) Managed Fishery | Crystal (Snow) crabs (*Chaceon albus*), Giant (King) crabs (P*seudocarcinus gigas*) and Champagne (Spiny) crabs (*Hypothalassia acerba*). | 2017/2018: 164.4 t<br>Commercial:<br>Class A: 123.2 t<br>Class B: 10 t<br>Class C: 0.1 t | Baited pots operated in a longline formation in the shelf edge waters (>150 m) | North of latitude 34° 24' S (Cape Leeuwin) and west of the Northern Territory border on the seaward side of the 150 m isobath out to the extent of the AFZ, mostly in 500 to 800 m of water.<br>Partially within the EMBA |
| West Coast Demersal Scalefish (Interim) Managed Fishery | West Coast Inshore Demersals:<br>West Australian Dhufish (*Glaucosoma hebraicum*), Pink snapper (*Pagrus auratus*) with other species captured including Redthroat Emperor (*Lethrinus miniatus)*, Bight Redfish (*Centroberyx gerrardi)* and Baldchin Groper *(Choerodon rubescens*).<br>West Coast Offshore Demersals:<br>Eightbar Grouper *Hyporthodus octofasciatus, Hapuku Polyprion oxygeneios*, Blue-eye Trevalla *Hyperoglyphe antarctica* and Ruby Snapper *Etelis carbunculus*. | 2017/2018: 248 t<br>2022/2023<br>Commercial: 294 t<br>Recreational: 342 t | Handline and drop line | The WCDSIMF encompasses the waters of the Indian Ocean just south of Shark Bay (at 26°30'S) to just east of Augusta (at 115°30'E) and extends seaward to the 200 nm boundary of the Australian Fishing Zone (AFZ).<br>The commercial fishery is divided into five management areas comprising four inshore areas and one offshore area. The inshore areas, i.e. Kalbarri, Mid-West, Metropolitan and South-West, extend outwards to the 250 m depth contour, while the Offshore Area extends the entire length of the fishery from the 250 m depth contour to the boundary of the AFZ.<br>Partially within the EMBA |
| West Coast Rock Lobster Managed Fishery (WCRLMF) | Western rock lobster (*Panulirus cygnus*) | 2016: 272 – 400 tonnes (346-481 t based on updated average weight)<br>2022/2023:<br>Commercial: 862 t (12 month)<br>Recreational: 401-476 t<br>Charter: 17 t | Baited traps (pots).<br>Pots and diving (recreational catch) | The fishery is situated along the west coast of Australia between Latitudes 21°44´ to 34°24´ S. The fishery is managed in three zones: Zone A – Abrolhos Islands, north of latitude 30° S excluding the Abrolhos Islands (Zone B) and south of latitude 30° S (Zone C).<br>Partially within the EMBA |
| Mackerel Fishery | Spanish mackerel (*Scomberomorus commerson*), grey mackerel (*S. semifasciatus*), with other species from the genera Scomberomorus, Grammatorcynus and | 2016:<br>Commercial: The commercial catch of Spanish mackerel was 276 t in 2016 | Trolling or handline<br>Near-surface trolling gear from vessels in coastal areas | The Fishery extends from the West Coast Bioregion to the WA/NT border, to the 200 nautical mile AFZ with most effort and catches recorded north of Geraldton, especially from the Kimberley and Pilbara coasts of the Northern Bioregion. |

| Fishery | Target Species | Catch[1] | Fishing Method | Area Description |
|---|---|---|---|---|
| | Acanthocybium also contributing to commercial catches. | (Gaughan & Santoro, 2018)<br>2022/2023:<br>Commercial:197 t<br>Recreational: 89-138 t | around reefs, shoals and headlands.<br>Jig fishing is also used to capture grey mackerel (S.semifasciatus) | Restricted to coastal and shallower waters.<br>Catches are reported separately for three Areas:<br>Area 1 – Kimberley (121º E to WA/NT border)<br>Area 2 -Pilbara (114º E to 121º E)<br>Area 3 – Gascoyne (27º S to 114º E) and West Coast (Cape Leeuwin to 27º S).<br>Partially within the EMBA |
| Western Australian Pearl Oyster Managed Fishery | Indo- Pacific silver-lipped pearl oyster (*Pinctada maxima*). | 2018: 468,573 shells<br>2022/2023:<br>Commercial: 756,531 shells | Drift diving restricted to shallow diveable depths. The collection of pearl oysters for the Pearl Oyster Managed Fishery is restricted to shallow diving depths below 35 m. Divers are attached to large outrigger booms on a vessel and towed slowly over the pearl oyster beds, harvesting legalised oysters by hand as they are seen. | The fishery is separated into four zones:<br>Pearl Oyster Zone 1: NW Cape (including Exmouth Gulf) to longitude 119°30'E. There are five licensees in this zone. No fishing in this zone since 2008<br>Pearl Oyster Zone 2: East of Cape Thouin (118°20´ E) and south of latitude 18°14´ S. The 9 licensees in this zone also have full access to Zone 3. This zone is the mainstay of the fishery.<br>Pearl Oyster Zone 3: West of longitude 125°20´ E and north of latitude 18°14´ S. The 2 licensees in this zone also have partial access to Zone 2.<br>Pearl Oyster Zone 4: East of longitude 125°20´ E to the Western Australia/Northern Territory border. Although all licensees have access to this zone, exploratory fishing has shown that stocks in this area are not economically viable. However, pearl farming does occur.<br>Partially within the EMBA |
| Western Australian Sea Cucumber Fishery (formerly known as Beche-de-mer) | Sandfish (*Holothuria scabra*) and deepwater redfish (*Actinopyga echinites*). | 2016: 93 t<br>2022/2023:<br>Commercial: 56 t | Hand-harvest fishery, with animals caught principally by diving, and a smaller | The Western Australian Sea Cucumber Fishery is permitted to operate throughout WA waters with the exception of a number of specific closures around the Dampier Archipelago, Cape Keraudren, Cape Preston and Cape |

| Fishery | Target Species | Catch[1] | Fishing Method | Area Description |
|---|---|---|---|---|
| | | | amount by wading. | Lambert, the Rowley Shoals and the Abrolhos Islands.<br>The fishery is primarily based in the northern half of the State, from Exmouth Gulf to the Northern Territory border.<br>Partially within the EMBA |
| **Commonwealth Managed Fisheries** | | | | |
| North West Slope Trawl | Scampi (crayfish): velvet scampi (*Metanephrops velutinus*) and boschmai scampi *(Metanephrops boschmai)*.<br>Deepwater prawns (penaeid and carid): pink prawn (*Parapenaeus longirostris)*, red prawn (*Aristaeomorpha foliacea*), striped prawn (*Aristeus virilis)*, giant scarlet prawn (*Aristaeopsis edwardsiana*), red carid prawn (*Heterocarpus woodmasoni*) and white carid prawn (*Heterocarpus sibogae*).<br>Snapper. | 2017-18: 79.7 t (total)<br>2021/2022: 85.8 t | Demersal crustacean trawl seaward of the 200 m isobath. | Extends from 114° E to approximately 125° E off the WA coast between the 200 m isobath and the outer limit of the Australian Fishing Zone (AFZ).<br>Partially within the EMBA |
| Western Skipjack Tuna Fishery | Skipjack tuna (*Katsuwonus pelamis*) | 2017-18: None in either zone<br>No catch since 2008/09 fishing season<br>9 permits awarded 2021/2022 | Purse seine | The Skipjack Tuna Fishery is split into two sectors; east and west. The Western Skipjack Tuna Fishery is located in all Australia waters west of 142° 30' 00°E, out to 200 nm from the coast.<br>There has been no fishing effort in the Skipjack Tuna Fishery since the 2008-09 season, and in that season activity concentrated off South Australia (Department of Agriculture 2019).<br>Partially within the EMBA |
| Southern Bluefin Tuna Fishery | Southern bluefin tuna (*Thunnus maccoyi*i). | 2017-18: 6,159 t<br>2022: 5,972 t | Purse seine vessels primarily in Great Australian Bight all year round and longline off southern | Fishery includes all waters of Australia, out to 200 nm from the coast. No current effort on the North West Shelf, fishing activity is concentrated in the Great Australian Bight and off South-east Australia (Department of Agriculture 2019).<br>Partially within the EMBA |

| Fishery | Target Species | Catch[1] | Fishing Method | Area Description |
|---|---|---|---|---|
| | | | NSW in winter.<br>Around 98% of Australia's SBT quota is taken by 5–10 purse seine vessels fishing for 13–25 kg southern bluefin tuna. | |
| Western Deepwater Trawl Fishery | A diverse range of species are caught, ranging from tropical and ruby snappers on the shelf edge to orange roughy *(Hoplostethus atlanticus*), oreo dories and bugs (*Ibacus* spp.) in the deeper temperate waters. | 2017-18: 101.9 t<br>2021/2022: 12 t | Demersal fish trawl seaward of the 200 m isobath. | Its northernmost point is from the boundary of the AFZ to longitude 114° E, and its southernmost point is from the boundary of the AFZ to longitude 115°08' E. Deep water off WA, from the 200 m isobath to the edge of the AFZ.<br>Partially within the EMBA |
| Western Tuna and Billfish Fishery | Broadbill swordfish (*Xiphias gladius*), albacore tuna (*Thunnus alalunga)*, striped marlin (*Kajikia audax*), bigeye tuna (*T. obesus)* and yellowfin tuna (*T. albacares*). | 2018: 278 t<br>2022: 139 t | Pelagic, longline, minor line and purse seine. | Extends westward from Cape York Peninsula (142°30' E) off Queensland to 34° S off the WA west coast. It also extends eastward from 34° S off the west coast of WA across the Great Australian Bight to 141° E at the South Australian–Victorian border. In recent years, fishing effort has concentrated off south-west Western Australia and South Australia with no current effort on the North West Shelf (Department of Agriculture 2019).<br>Partially within the EMBA |

Source: Apache (2008); Australian Fisheries Management Authority (2011); Department of Fisheries (2013), Stakeholder consultation.
[1]Sources for catch data: Department of Agriculture 2019; Gaughan et al., 2019; DPIRD 2018, DPIRD 2023, Newman et al 2023

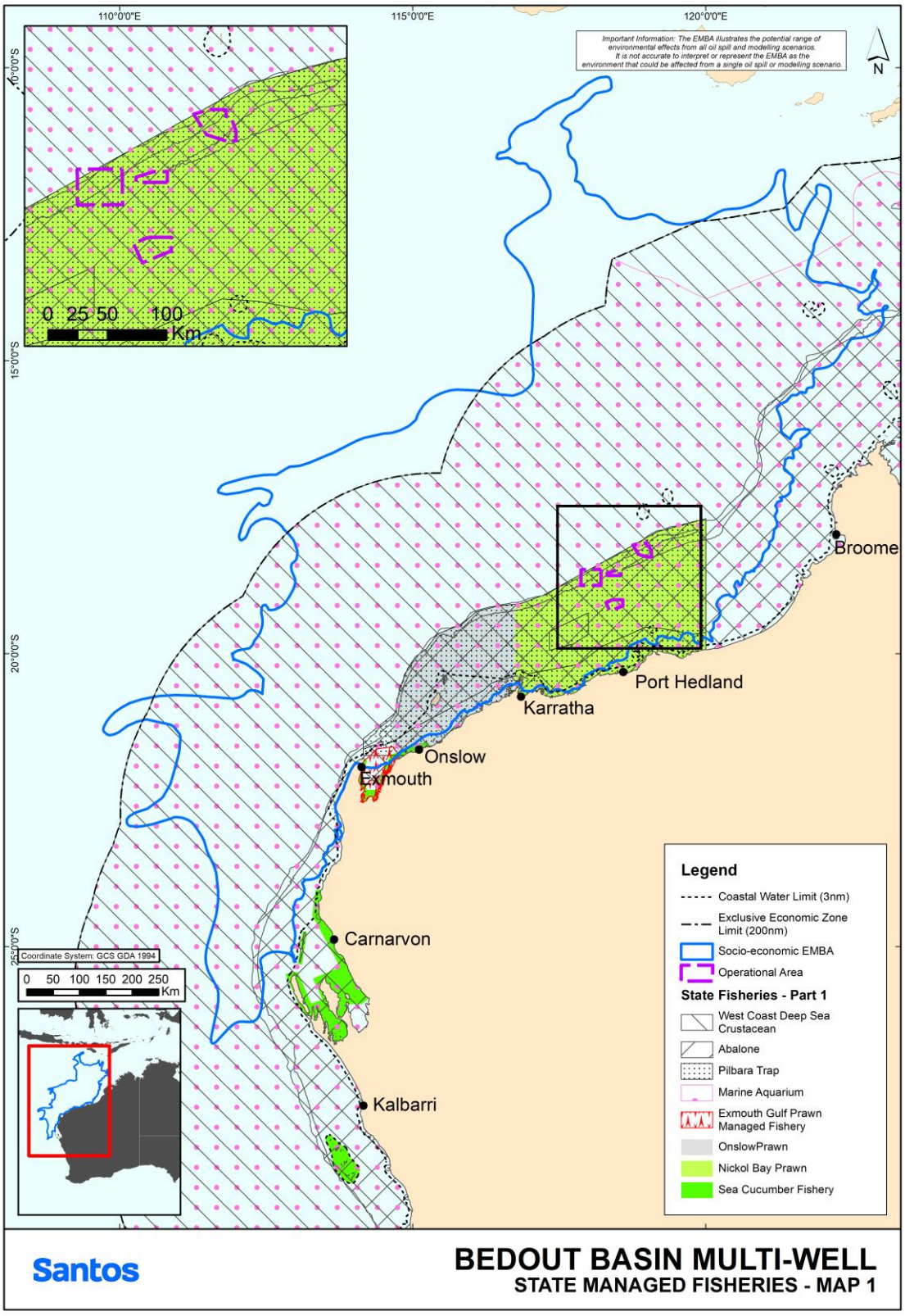



**Figure 19: WA State managed fisheries overlapping the EMBA – Map 1**

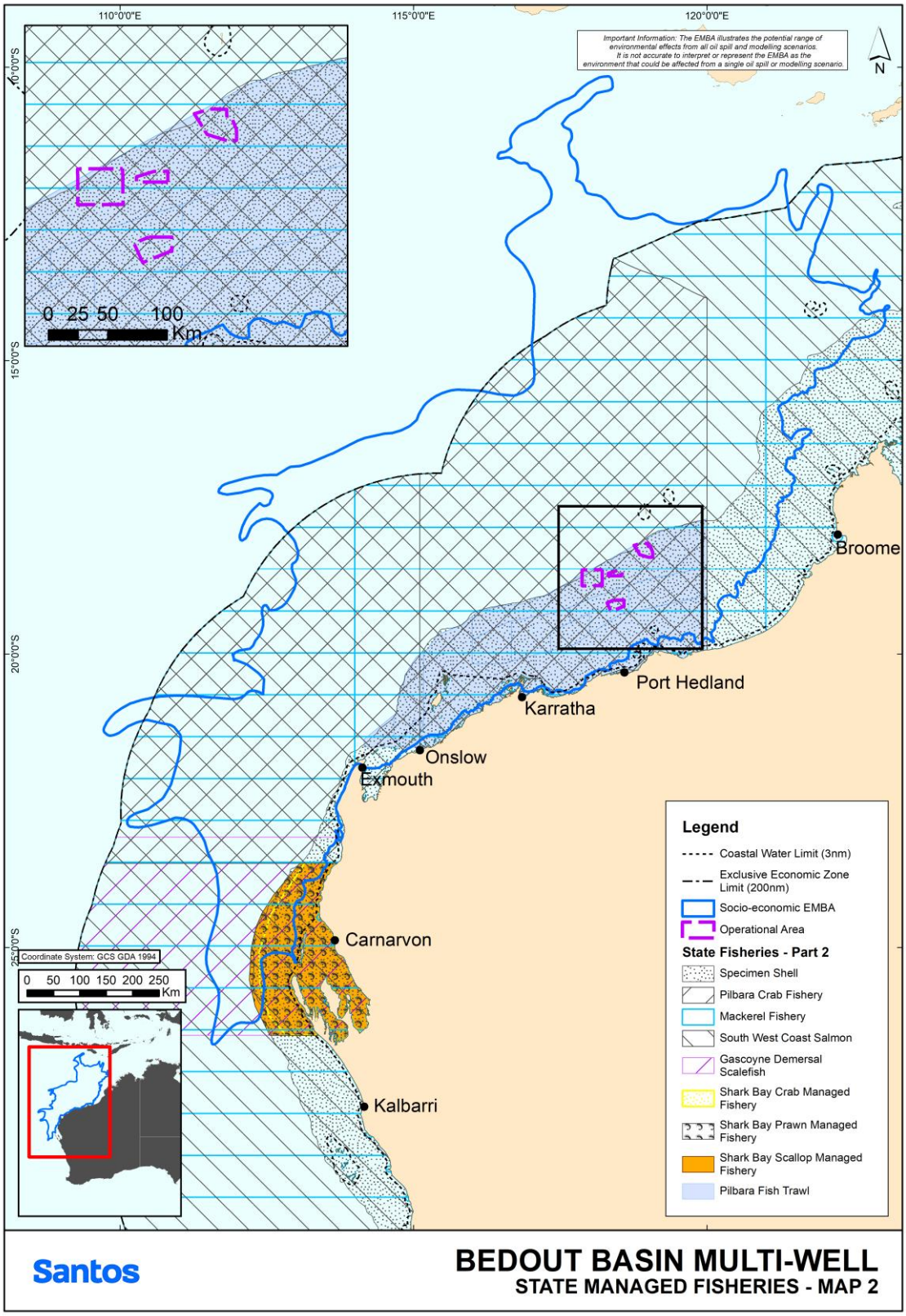



**Figure 20: WA State managed fisheries overlapping the EMBA – Map 2**

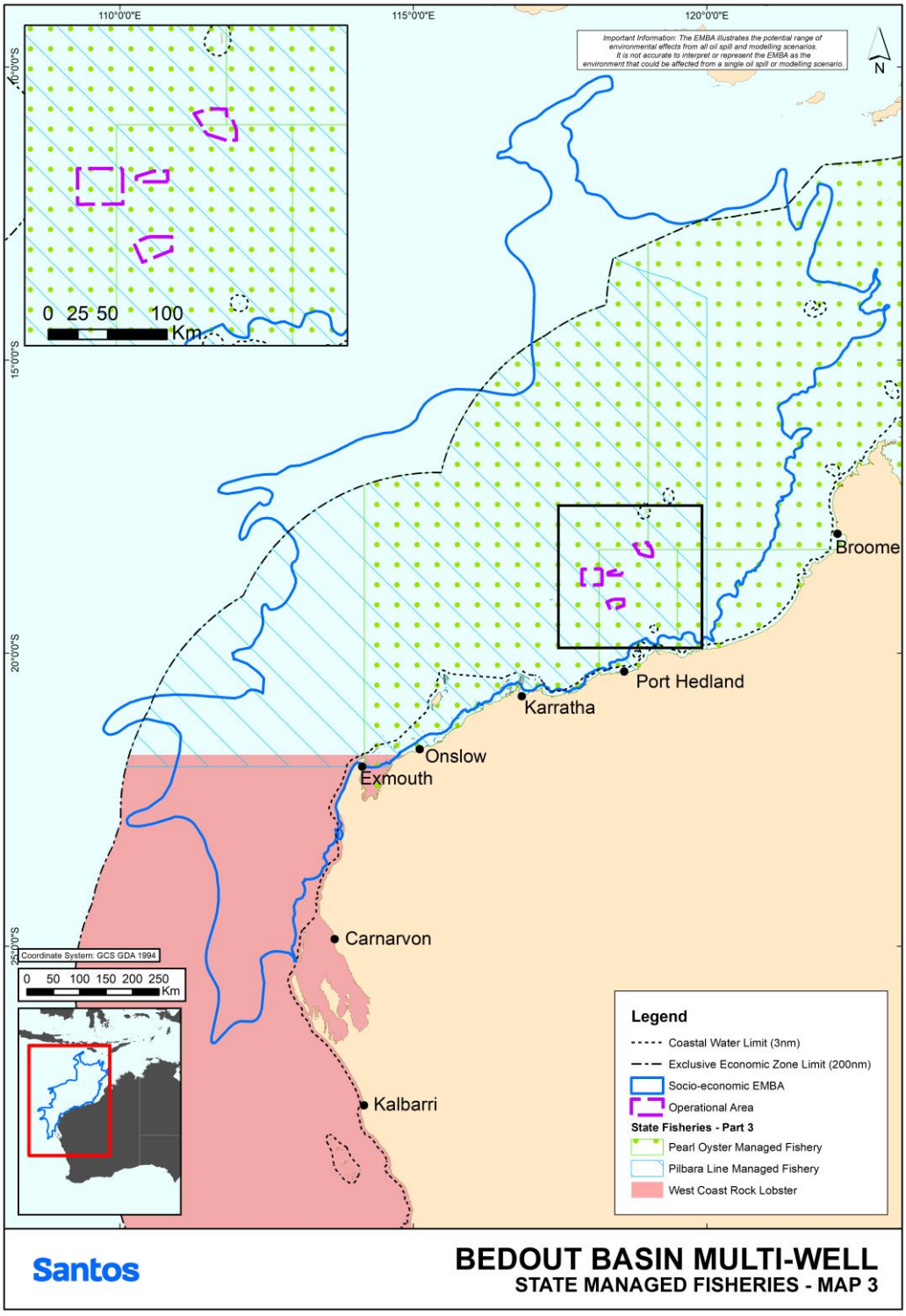



**Figure 21: WA State managed fisheries overlapping the EMBA – Map 3**

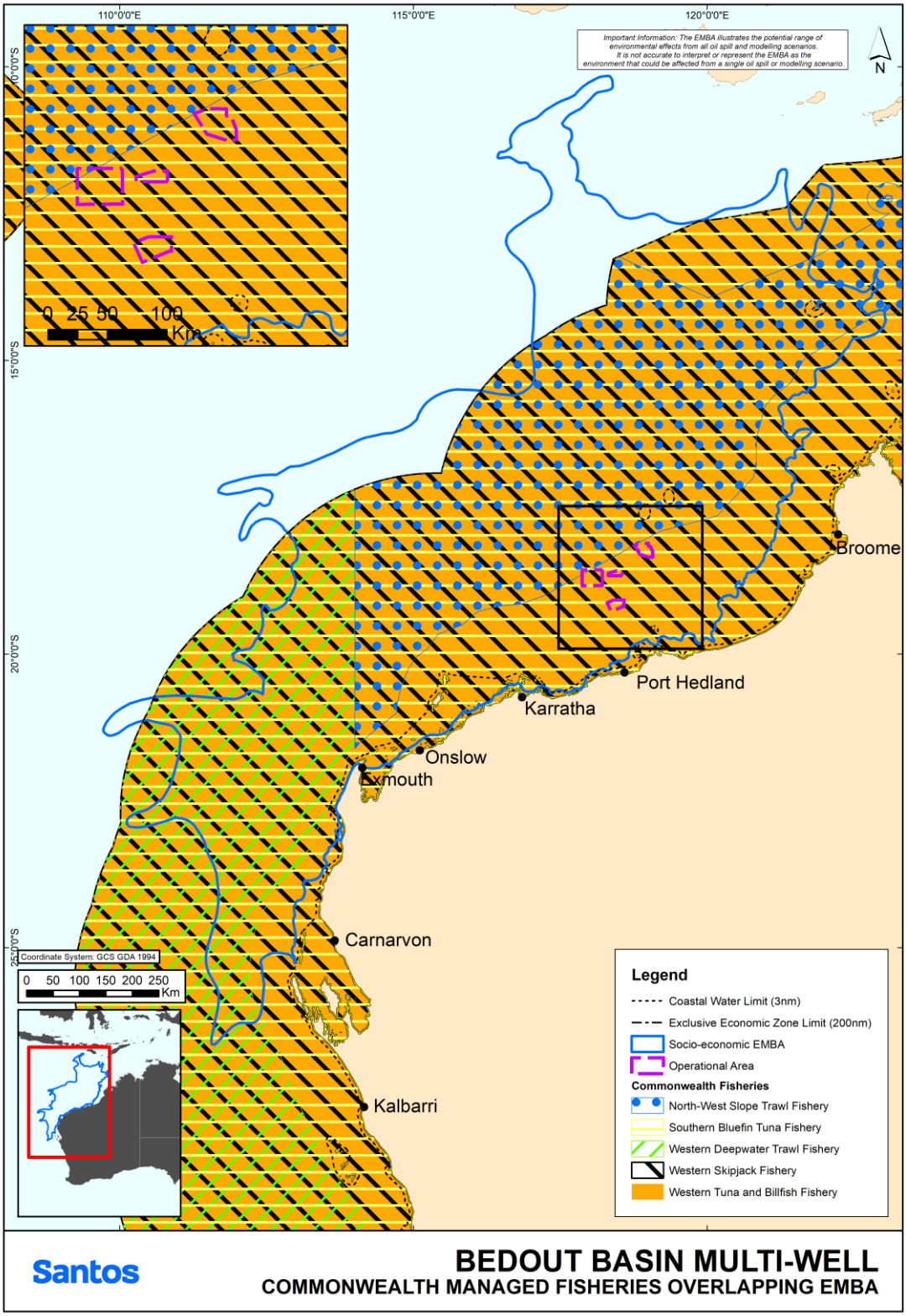



**Figure 22: Commonwealth managed fisheries overlapping the EMBA**

# 14.1. Aquaculture

### 14.1.1. Gascoyne Coast Bioregion

Hatchery production of oysters is the core of the pearling industry in the Gascoyne region. Hatcheries in Carnarvon and Exmouth supply spat to pearl farms in the north-west and several hatcheries supply juveniles to the black-lip pearl oyster to developing black pearl farms in the region. Pearl production is carried out on a small scale in Shark Bay and Exmouth Gulf. The local aquiculture sector is also focussing on the production of aquarium species.

### 14.1.2. North Coast Bioregion

Aquaculture development in this region is dominated by the production of pearls from the species *Pinctada maxima.* Each year, approximately 500,000 wild individuals are harvested, with the majority being from Eighty Mile Bean in Broome, Western Australia (sourced from Fisheries Research and Development Cooperation in Thomas and Miller 2022). A large number of pearl oysters for seeding is obtained from wild stocks and supplemented by hatchery-produced oysters with major hatcheries operating at Broome and the Dampier Peninsular. Pearl farm sites are located mainly along the Kimberley coast, particularly in the Buccaneer Archipelago, in Roebuck Bay and at the Montebello Islands. Developing marine aquaculture initiatives in this region include growing trochus and barramundi. The - Fishery of Western Australia operates in shallow coastal waters (DoF 2006). All the leases are within the 35m diving depth, with commercial diving predominantly occurring in nearshore habitats of 8-15 m depths (sourced from Fisheries Research and Development Cooperation in Thomas and Miller, 2022). Thomas and Miller (2022) demonstrated high levels of gene flow among inshore (8-15 m water depth) and offshore sites (35 m water depth) and no differences in genetic diversity between depths indicating high levels of dispersal and connectivity among inshore and offshore fishing grounds

The Pearl Producer's Association (PPA) assert that spawning stock for pearl oysters occur out to the 100 m depth contour, however, evidence for this is lacking. Condie et al. (2006) modelled oyster larva transport in the Eighty Mile Beach region and found that while some larvae travelled more than 60 km, most were transported less than 30 km. The model results suggested that spawning in the Eighty Mile Beach region is concentrated around the 8 to 15m depth range, with potential smaller contributions from the northeast. These spawning events are likely to lead to successful recruitment locally and alongshore to the southwest.

However, spat abundances seem to be low in these areas, suggesting that recruitment is strongly limited by habitat availability and possibly high mortality rates in shallow water. High local abundances of broodstock and spat observed occasionally in deeper water (<30 m) seem to be supported by intermittent larval transport from inshore populations. Spawning in this area seems to contribute little to recruitment in the inshore populations.

Whalan et al. (2021) used image-based and acoustic methods to elucidate distribution patterns of *P. maxima* off Eighty Mile Beach, including data from 862 km$^2$ of multibeam survey and 119 towed video transects spanning an area from the 20 to 100 m contour lines. They quantified habitat characters including depth, substrate, and benthic community composition associated with pearl oyster distribution. Multibeam sonar data was also coupled with towed video data to produce predictive statistical models of *P. maxima* habitat. They found *P. maxima* to depths of 76 m, although more than 90 % of individuals occurred shallower than 40 m and less than 2 % were found deeper than 50 m. Oysters occupied flat, sandy habitats with neighbouring benthic communities of filter feeders (>98 % of observations). These results show *P. maxima* predominantly occurs in depths < 40 m, with no evidence that extensive populations extend into deep water in the region.

Further aquaculture in this region mainly focuses on barramundi farming within Cone Bay, with two aquaculture licences granted in this area located about 200 km north-east of Broome (Gaughan and Santoro 2020).

Further aquaculture operations have expanded in the region with the establishment of the Kimberley Aquaculture Development zone, which encompasses almost 2,000 ha of coastal waters within Cone Bay supporting the production of up to 20,000 t of finfish annually (Gaughan and Santoro 2020).

# 14.2. Recreational Fisheries

### 14.2.1. West Coast Bioregion

The marine environment of the West Coast Bioregion which lies between Kalbarri and Augusta is predominantly a temperate oceanic zone, but it is heavily influenced by the Leeuwin current, which transports warm tropical water southward along the edge of the continental shelf. This region contains the state's major population centres and is

the most heavily used bioregion for recreational fishing (Fletcher and Santoro 2015). The range of recreational fishing opportunities includes estuarine fishing, beach fishing and boat fishing either in embayments or offshore for demersal and pelagic game species often around the islands and out to the continental shelf (WAFIC 2016).

### 14.2.2. Gascoyne Coast Bioregion

The Gascoyne Coast Bioregion extends from just north of Kalbarri to the Ashburton River, south of Onslow. The marine environment of this region represents a transition between the fully tropical waters of the north-west shelf of the north coast region and the temperate waters of the west coast region. This region has been identified as one of the 18 world 'hotspots' in terms of tropical reef endemism and the second most divers marine environment in the world in terms of tropical reef species. This region is a focal point for winter recreational fishing and is a key component of many tourist visits. Angling activities include beach and cliff fishing (e.g. Steep Point and Quobba), embayment and shallow-water boat angling (e.g. Shark Bay, Exmouth Gulf and Ningaloo lagoons), and offshore boat angling for demersal and larger pelagic species (e.g. off Ningaloo). The predominant target species include the tropical species such as emperors, tropical snappers, groupers, mackerels, trevallies and other game fish. Temperate species at the northern end of their ranges such as pink snapper, tailor and whiting also provide significant catches, particularly in Shark Bay (WAFIC 2016).

### 14.2.3. North Coast Bioregion

The North Coast Bioregion (Pilbara/Kimberley) runs from the Ashburton River to the Western Australia/Northern Territory border (WAFIC 2016). The oceanography of this region includes waters of Pacific Ocean origin that enter through the Indonesian archipelago bringing warm, low salinity waters polewards via the Indonesian throughflow and Holloway currents which flow seasonally and interact with Indian ocean waters. Recreational fishing is experiencing a significant growth in this region, with a distinct seasonal peak in winter when the local population increases by significant numbers of metropolitan and inter-state tourists. This has been added to by the increased recreational fishing by those involved in the construction or operation of major developments in this region. Owing to the high tidal range, much of the angling activity is boat-based with beach fishing limited to periods of flood tides and high water. Numerous creek systems, mangroves, rivers and ocean beaches provide shore and small boat fishing for a variety of species including barramundi, tropical emperors, mangrove jack, trevallies, sooty grunter, threadfin, mud crabs and cods. Offshore islands, coral reef systems and continental shelf waters provide species of major recreational interest including saddletail snapper and red emperor, cods, coral and coronation trout, sharks, trevally, tuskfish, mackerels and billfish (WAFIC 2016).

# 15. References

## 15.1. Physical Environment


Asian Development Bank (ADB) 2014. State of the Coral Triangle: Indonesia. Mandaluyong City, Philippines 2014.

BHPB 2005. Pyrenees Development. Draft EIS. BHP Billiton Petroleum. Perth

Blaber SJM and Young JW and Dunning, MC 1985. Community structure and zoogeographic affinities of the coastal fishes of the Dampier region of north-western Australia. *Australian Journal of Marine and Freshwater* Research 36(2): 247–266

Brewer, D.T., Potter, A., Skewes, T.D, Lyne, V., Andersen, J., Davies, C., Taranto, T.,Heap, A. D., Murphy, N. E., Rochester, W. A., Fuller, M., Donovan, A. (2009).Conservation values in Commonwealth waters of the Christmas and Cocos (Keeling)Islands remote Australian Territories. Report to Department of Environment and Water Resources. CSIRO, Cleveland. 216 pp.

BoM (Bureau of Meteorology) 2013. Climatology of Tropical Cyclones in Western Australia. Bureau of Meteorology, Canberra, ACT. Available at http://www.bom.gov.au/cyclone/climatology/wa.shtml [Accessed 31 July 2013]

Condie, S, Andrewartha, J, Mansbridge, J and Waring, J 2006. Modelling circulation and connectivity on Australia's North West Shelf. North West Shelf Joint Environmental Management Study: Technical Report No. 6. CSIRO Marine and Atmospheric Research, Hobart, Tasmania

DEC 2013. Ngari Capes Marine Park management plan 2013 Shelf, Western Australian Department of Environment and Conservation, Perth

DEWHA 2008a. The North-west Marine Bioregional Plan: Bioregional profile: A Description of the Ecosystems, Conservation Values and Uses of the North-West Marine Region. Department of the Environment Water, Heritage and the Arts, Canberra, Australian Capital Territory

DEWHA 2008b. The South-west Marine Bioregional Plan: Bioregional profile: A Description of the Ecosystems, Conservation Values and Uses of the South-West Marine Region. Department of the Environment Water, Heritage and the Arts, Canberra, Australian Capital Territory

Fugro, 2015. Barossa Field Meteorological, Current Profile, Wave and CTD Measurements – Final Report. Reporting Period: 8 July 2014 to 16 July 2015. Report prepared for ConocoPhillips Australia Pty Ltd., Perth, Western Australia

Holloway, PE 1983. Tides on the Australian north west shelf. *Australian Journal of Marine and Freshwater Research*, 34(1): 213–230

Holloway, PE and Nye, HC 1985 Leeuwin current and wind distributions on the southern part of the Australian North West Shelf between January 1982 and July 1983. *Australian Journal of Marine and Freshwater Research* 36(2): 123–137

McKinnon, AD, Meekan, MG, Carleton, JH, Furnas, MJ, Duggan, S and Skiring, W 2003 Rapid changes in shelf water and pelagic communities on the southern Northwest Shelf, Australia, following a tropical cyclone. *Continental Shelf Research* 23: 93–111

McLoughlin, RJ and Young, PC. 1985. Sedimentary provinces of the fishing grounds of the North-West Shelf of Australia: Grain-Size frequency analysis of surficial sediments. *Australian Journal of Marine and Freshwater Research* 36: 671–81

NSR 1995. Wandoo full field development. Public Environmental Report for Ampolex Ltd, NSR Environmental Consultants Pty Ltd. November 1995

O'Hara, TD. 2023. An assessment of the offshore marine natural values of Australia's Indian Ocean Territories. Museums Victoria.

Pearce, A and Pattiaratchi, C. 1999. The Capes Current: a summer countercurrent flowing past Cape Leeuwin and Cape Naturaliste, Western Australia. *Continental Shelf Research* 19: 401-420

Przeslawski, R., Daniell, J., Anderson, T., Barrie, J.V., Battershill, C., Heap, A., Hughes, M., Li, J., Potter, A., Radke, R., Siwabessy, J., Tran, M, Whiteway, T., Nichol, S., 2011. Seabed Habitats and Hazards of the Joesph Bonaparte Gulf and Timor Sea, Northern Australia. Geoscience Australia, record 2011/40. Geoscience Australia, Canberra, Australian Capital Territory.

SSE 1991. Normal and extreme environmental design criteria. Campbell and Sinbad locations, and Varanus Island to Mainland Pipeline. Volume 1. Prepared for Hadson Energy Limited by Steedman Science and Engineering. Report E486. March 1991

SSE 1993. Review of oceanography of North West Shelf and Timor Sea regions pertaining to the environmental impact of the offshore oil and gas industry. Vol I prepared for Woodside Offshore Petroleum and the APPEA Review Project of Environmental Consequences of Development Related to the Petroleum Production in the Marine Environment: Review of Scientific Research, Report E1379, October 1993

WNI 1995. Preliminary report on ambient and non-cyclonic design criteria for the Stag location. WNI Science & Engineering. December 1995

WNI 1996. Metocean Conditions on the North West Shelf of Australia, Cape Lambert to the North West Cape Relating to Jack-up Drilling Operation. (DR-50-ED-001). July 1996

Woodside 2005. The Vincent Development. Draft EIS. EPBC Referral 2005/2110. Woodside Energy, Perth

## 15.2. Benthic and Pelagic Habitats

Adam, A.A.S. et al. 2022. Population connectivity and genetic offset in the spawning coral *Acropora digitifera* in Western Australia, *Molecular Ecology*, 31(13): 3533–3547

AIMS 2014. Benthic habitat characterisation of Montgomery Reef, Kimberley region, Western Australia. Available at http://data.aims.gov.au/metadataviewer/uuid/b4175af1-e213-4ac7-a7e8-baa121f709b2 [Accessed April 2014]

Amalfi C 2006. Flowers of the Ocean: WA's Expansive Seagrass Meadows; Western Fisheries Nov 2006, pg. 6-9

Australian Ocean Data Network 2017, Australian Phytoplankton Database, Integrated Marine Observing System. Available from: https://portal.aodn.org.au/ [Accessed: 20/11/2017]

Bancroft KP & JA Davidson 2000. Bibliography of marine scientific research relevant to the conservation of Ningaloo Marine Park and adjacent waters. Marine Conservation Branch, Department of Conservation and Land Management, Perth, Western Australia

BHPBIO 2011. Proposed Outer Harbour Development, Port Hedland Public Environmental Review/Draft Environmental Impact Statement. BHP Billiton Iron Ore, Perth, Western Australia

Blakeway D & Radford BTM 2004. Scleractinian corals of the Dampier Port and inner Mermaid Sound: species list, community composition and distributional data. Corals of the Dampier Harbour: Their survival and reproduction during the dredging programs of 2004, 1–8

Brooke BP 1997. Geomorphology of the islands and reefs of the central western Kimberley coast In: Marine Biological Survey of the Central Kimberley Coast, Western Australia, Ed DI Walker, University of Western Australia, Western Australia

Brewer DT, Lyne V, Skewes TD and Rothlisberg P 2007. Trophic Systems of the North West Marine Region Prepared for the Department of the Environment, Water, Heritage and the Arts by CSIRO Marine and Atmospheric Research, Cleveland, Queensland

Brewer, D.T., Potter, A., Skewes, T.D, Lyne, V., Andersen, J., Davies, C., Taranto, T. Heap, A. D., Murphy, N. E., Rochester, W. A., Fuller, M., Donovan, A. 2009. Conservation values in Commonwealth waters of the Christmas and Cocos (Keeling) Islands remote Australian Territories. Report to Department of Environment and Water Resources. CSIRO, Cleveland. 216 pp

Brown K & Skewes T 2005. A preliminary assessment of the ecology of seagrasses at Ashmore Reef. In: Understanding the Cultural and Natural Heritage Values and Management Challenges of the Ashmore Region, Proceedings of a Symposium organised by the Australian Marine Sciences Association and the Museum and Art Gallery of the Northern Territory, Darwin, 4-6 April 2001. Edited *by* B Russell, H Larson, CJ Glasby, RC Willan, and J Martin. Museum and Art Galleries of the Northern Territory & Australian Marine Sciences Association, Darwin, Northern Territory. pp. 143–152

CALM, NPNCA 1996. Shark Bay Marine Reserves Management Plan 1996–2006. Management Plan No. 34. Department of Conservation and Land Management and National Parks and Nature Conservation Authority, Perth, Western Australia

CALM, MPRA 2005a. Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005–2015. Management Plan No. 52. Department of Conservation and Land Management and Marine Parks and Reserves Authority, Perth, Western Australia

CALM, MPRA 2005b. Indicative Management Plan for the Proposed Dampier Archipelago Marine Park and Cape Preston Marine Management Area. Department of Conservation and Land Management and Marine Parks and Reserves Authority, Perth, Western Australia

Ceccarelli DM, Richards ZT, Pratchett MS, and Cvitanovic C (2011) Rapid increase in coral cover on an isolated coral reef, the Ashmore Reef National Nature Reserve, north-western Australia. Marine and Freshwater Research 62(10): 1214

Chevron 2010. Draft Environmental Impact Statement/Environmental Review and Management Programme for the Proposed Wheatstone Project Volume 1 (Chapters 1 to 6), 6.0 Overview of Existing Environment. Chevron Australia Pty Ltd, Perth, Western Australia

DEC 2008. Preliminary reconnaissance survey of benthic habitats in the Anjo Peninsula area, Kimberley Bioregion, Western Australia. Prepared for Northern Development Taskforce, Department of Industry and Resources by Department of Environment and Conservation, Perth, Western Australia, October 2008

DEC 2013. Ngari Capes Marine Park management plan 2013. Department of Environment and Conservation, Perth

DEWHA 2008a. The North-west Marine Bioregional Plan Bioregional profile: A Description of the Ecosystems, Conservation Values and Uses of the North-west Marine Region. Department of the Environment, Water, Heritage and the Arts, Canberra, Australian Capital Territory

DEWHA 2008b. The South-west Marine Bioregional Plan: Bioregional profile: A Description of the Ecosystems, Conservation Values and Uses of the South-West Marine Region. Department of the Environment Water, Heritage and the Arts, Canberra, Australian Capital Territory

DEWHA 2008c. The North Marine Bioregional Plan Bioregional profile: A Description of the Ecosystems, Conservation Values and Uses of the North Marine Region. Department of the Environment, Water, Heritage and the Arts, Canberra, Australian Capital Territory

Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC). 2012. Marine Bioregional Plan for the North Marine Region. Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Capital Territory

Director of National Parks 2012. Christmas Island National Park – Draft management Plan 2012-2022 Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Capital Territory

DoF 2007. Plan of Management for the Kalbarri Blue Holes Fish Habitat Protection Area. Department of Fisheries, Fisheries Management Paper No. 188, Perth, Western Australia

DoF 2012. Exploring the Houtman Abrolhos Islands. Published by Department of Fisheries, Perth, Western Australia. Publication No. 105, June 2012.

Done TJ Williams D Mc B, Speare P, Turak E, Davidson J, DeVantier LM, Newman SJ & Hutchins JB 1994. Surveys of Coral and Fish Communities at Scott Reef and Rowley Shoals. Australian Institute of Marine Science, Townsville, Queensland

[DoNP] Director of National Parks. (2012). Christmas Island National Park Management Plan 2014 – 2024.

[DoNP] Director of National Parks. (2015). Pulu Keeling National Park Management Plan 2015 – 2025.DPAW 2009. Shark Bay World Heritage Area. Department of Parks and Wildlife, Perth, Western Australia. Available at http://www.sharkbay.org/Stromatolitesfactsheet.aspx [Accessed April 2014]

DPAW 2013. Lalang-garram/ Camden Sound Marine Park Management Plan 73 2013–2023. Department of Parks and Wildlife, Perth, Western Australia

EA 2000. Mermaid Reef Marine National Nature Reserve Plan of Management 2000-2007. Environment Australia, Canberra, Australian Capital Territory

Gage JD, Tyler PK 1992. Deep-sea Biology: A Natural History of Organisms at the Deep Sea Floor. Cambridge University Press, Cambridge, UK

Gilmour, J, Smith, L, Cook, K and Pincock, S 2013. Discovering Scott Reef: 20 years of exploration and research. Australian Institute of Marine Science, Perth, Western Australia.

Gilmour, J.P. et al. 2016. Biannual Spawning and Temporal Reproductive Isolation in Acropora Corals*, PLOS ONE*. Edited by N. Johnson, 11(3), p. e0150916. Available at: https://doi.org/10.1371/journal.pone.0150916

Gilmour JP, Cook KL, Ryan NM, Puotinen ML, Green RH, Shedrawi G, Hobbs J-PA, Thomson DP, Babcock RC, Buckee J, Foster T, Richards ZT, Wilson SK, Barnes PB, Coutts TB, Radford BT, Piggott CH, Depczynski M, Evans SN, Schoepf V, Evans RD, Halford AR, Nutt CD, Bancroft KP, Heyward AJ, Oades D 2019. The state of Western Australia's coral reefs. Coral Reefs, vol. 38, pp. 651-667

Griffith JK 1997. The Corals Collected During September/October at Ashmore Reef, Timor Sea. Parks Australia

Griffith JK 2004. Scleractinian corals collected during 1998 from the Dampier Archipelago, Western Australia. Records of the Western Australian Museum Supplement No. 66: 101–120

Hale J, Butcher R 2013. Ashmore Reef Commonwealth Marine Reserve Ramsar Site Ecological Character Description. A report to the Department of the Environment, Canberra, Australian Capital Territory

Hanson C.E. & McKinnon A.D 2009, Pelagic ecology of the Ningaloo region, Western Australia: influence of the Leeuwin Current, Journal of the Royal Society of Western Australia, vol. 92, pp. 129-137

Heyward, A, Revill, A and Sherwood, C 2006. Review of research and data relevant to marine environmental management of Australia's North West Shelf North West Shelf Joint Environmental Management Study: Technical Report No. 1. CSIRO Marine and Atmospheric Research, Hobart, Tasmania

Heyward, A., Radford, B., Burns, K., Colquhoun, J., Moore, C. 2010. Montara Surveys: Final report on Benthic Surveys at Ashmore, Cartier and Seringapatam Reefs. Australian Institute of Marine Science, Crawley Western Australia

Heyward, A., Jones, R., Travers, M., Burns, K., Suosaari, G., Colquhoun, J., Case, M., Redford, B., Meekan, M., Markey, K., Schenk, T., O'Leary, R.A., Brooks, K., Tinkler, P., Cooper, T., Emslie, M. 2012. Montara: 2011 shallow reef surveys at Ashmore, Cartier and Seringapatam reefs (Monitoring Study No. S6B Coral Reefs). Australian Institute of Marine Science, Townsville

Heyward, A., Radford, B., Cappo, M., Wakeford, M., Fisher, R., Colquhoun, J., Case, M., Stowar, M. and Miller K. 2017. Barossa Environmental Baseline Study, Regional Shoals and Shelf Assessment 2015 Final Report. A report for ConocoPhillips Australia Exploration Pty Ltd by the Australian Institute of Marine Science, Perth 2017

Hooper J, Ekins M 2004. Collation and Validation of Museum Collection Databases related to the Distribution of Marine Sponges in Northern Australia. (Contract National Oceans Office C2004/020), Unpublished Report to the National Oceans Office, Brisbane: Queensland Museum

Huisman J 2004. Marine benthic flora of the Dampier Archipelago, Western Australia. pages 61–68 In: D.S. Jones (ed.) Marine Biodiversity of the Dampier Archipelago, Western Australia 1998–2002, Report of the Western Australian Museum, 2004, 401 pp., Western Australian Museum, Perth

Huisman JM, Leliaert F, Verbruggen H, Townsend RA 2009. Marine Benthic Plants of Western Australia's Shelf Edge Atolls. Records of the Western Australian Museum Supplement No. 77: 50–87

INPEX 2008. Presentation at the Northern Development Taskforce Site Evaluation Workshop. Broome, WA, 24 July 2008

IRCE 2002. Victoria, Little Sandy and Pedrika wells environmental monitoring programme. Prepared for Apache Energy Ltd by IRC Environment, Perth, Western Australia

IRCE (2003) Environmental monitoring of drilling discharges in shallow water habitats. Prepared for Apache Energy Ltd by IRC Environment, Perth, Western Australia

IRCE (2004) Biannual Coral Monitoring Survey 2004. Prepared for Apache Energy Ltd by IRC Environment, Perth, Western Australia

IRCE (2006) Biannual Macroalgae Monitoring Survey 2005. Prepared for Apache Energy Ltd by IRC Environment, Perth, Western Australia

IRCE 2007. Annual Marine Monitoring 2007: Lowendal and Montebello Islands Macroalgal Survey. Prepared for Apache Energy Ltd by IRC Environment, Perth, Western Australia

Keesing JK, Irvine TR, Alderslade P, Clapin G, Fromont J, Hosie AM, Huisman JM, Philips JC, Naughton KM, Marsh LM, Slack-Smith SM, Thomson DP, Watson JE (2011). Marine benthic flora and fauna of Gourdon Bay and the Dampier Peninsula in the Kimberley region of north-western Australia. Journal of the Royal Society of Western Australia 94, no. 2 (2011): 285-301

Kendrick GA, Huisman JM and Walker DI (1990). Benthic Macroalgae of Shark Bay, Western Australia. Botanica Marina 33: 47–54

Kendrick GA, Nowicki RJ, Olsen YS, Strydom S, Fraser MW, Sinclair EA, Statton J, Hovey RK, Thomson JA, Burkholder DA, McMahon KM, Kilminster K, Hetzel Y, Fourquean JW, Heithaus MR, Orth RJ (2019). A Systematic Review of How Multiple Stressors From an Extreme Event Drove Ecosystem-Wide Loss of Resilience in an Iconic Seagrass Community. Frontiers in Marine Science, 6, 455. 10.3389/fmars.2019.00455/full

Kilminster, K., Hovey, R., Waycott, M., Kendrick, G.A. (2018). Seagrasses of Southern and South-Western Australia. In: Larkum, A., Kendrick, G., Ralph, P. (eds) Seagrasses of Australia. Springer, Cham. https://doi.org/10.1007/978-3-319-71354-0_3

Lanyon JM & Marsh H 1995. Temporal changes in the abundance of some tropical intertidal seagrasses in North Queensland. Aquatic Botany 49:217–237

Last P, Lyne V, Yearsley G, Gledhill D, Gomon M, Rees T & White W, (2005) Validation of National Demersal Fish Datasets for the Regionalisation of the Australian Continental Slope and Outer Shelf (>40 m depth), Department of Environment and Heritage and CSIRO Marine

LEC, Astron 1993. Griffin Gas Pipeline Development Consultative Environmental Review. Prepared for BHP Petroleum and Doral Resources by LeProvost Environmental Consultants and Astron Engineering, Perth, Western Australia

Marsh LM 1990. Hermatypic corals of Shark Bay, Western Australia. In: Research in Shark Bay – Report of the France-Australe Bicentenary Expedition Committee, eds PF Berry, SD Bradshaw, BR Wilson, Western Australian Museum, Perth, pp 115–128

Masini R, Sim C, Simpson C 2009. Protecting the Kimberley: a synthesis of scientific knowledge to support conservation management in the Kimberley region of Western Australia, Part A. Department of Environment and Conservation, Perth, Western Australia

McCook L J, Klumpp DW, McKinnon AD 1995. Seagrass communities in Exmouth Gulf, Western Australia. A preliminary survey. Journal of the Royal Society of Western Australia 78: 81–87

McKinney, D 2009. A survey of the scleractinian corals at Mermaid, Scott, and Seringapatam Reefs, Western Australia, Records of the Western Australian Museum, Supplement, 77(1): 105. Available at: https://doi.org/10.18195/issn.0313-122x.77.2009.105-143.

Mellbrand, K., Lavery, P.S., Hyndes, G. et al. 2011. Linking Land and Sea: Different Pathways for Marine Subsidies. Ecosystems 14, 732–744. https://doi.org/10.1007/s10021-011-9442-x

NASA 2017, Global Patterns and Cycles, Earth Observatory. Available from: https://earthobservatory.nasa.gov/Features/Phytoplankton/page4.php [Accessed 24/11/2017].

O'Hara, TD. 2023. An assessment of the offshore marine natural values of Australia's Indian Ocean Territories. Museums Victoria

Orr M, Zimmer M, Jelinski DE, & Mews M 2005. Wrack deposition on different beach types: spatial and temporal variation in the pattern of subsidy. Ecology 86(6), 2005, pp. 1496–1507

Pattiaratchi C. 2007, Understanding areas of high productivity within the South-West Marine Region, Prepared for the Department of the Environment, Water, Heritage and the Arts.

Pike G & Leach GJ 1997. Handbook of Vascular Plants of Ashmore and Cartier Islands. Parks and Wildlife Commission of the Northern Territory and Parks Australia, Canberra, Australian Capital Territory

Pratchett MS, Munday P, Wilson SK, Graham NA, Cinner JE, Bellwood DR, Jones GP, Polunin & McClanahan TR 2008. Effects of climate-induced coral bleaching on coral-reef fishes. Ecological and economic consequences. Oceanography and Marine Biology: Annual Review 46: 251-296

Prince RIT 1986. Dugong in northern waters of Western Australia 1984. Technical Report No7, Department of Conservation and Land Management, WA

Radform, B. and Puotinen, M. 2016. Spatial Benthic Model for the Oceanic Shoals Commonwealth Marine Reserve. Australian Institute of Marine Science, Perth, Western Australia. Available at: https://northwestatlas.org/node/1710 [accessed 10/12/2019]

Rees M, Heyward A, Cappo M, Speare P, Smith L 2004. Ningaloo Marine Park – Initial Survey of Seabed Biodiversity in Intermediate and Deeper Waters. Prepared for Australian Government Department of the Environment and Heritage by Australian Institute of Marine Science, Townsville, Queensland

Richards ZT, Bryce M, Bryce C (2013) New records of atypical coral reef habitat in the Kimberley, Australia. Journal of Marine Biology 2013, 363894

RPS Environmental 2008. INPEX environmental impact assessment studies – Technical appendix: Marine Ecology. Prepared for INPEX Browse LTD by RPS Environmental, Perth, Western Australia

RPS BBG 2005. Gorgon Development of Barrow Island Technical Report Marine Benthic Habitats. Report No. R03207. Prepared for ChevronTexaco Australia Pty Ltd by RPS Bowman Bishaw Gorham, Perth, Western Australia, April 2005

Russell BC, Hanley JR 1993. History and Development. In: Survey of the Marine Biological and Heritage Resources of Cartier and Hibernia Reefs, Timor Sea. Northern Territory Museum of Arts and Sciences, Darwin

Seagrass-Watch 2019. Kimberley Region. Available at http://www.seagrasswatch.org/WA.html [Accessed December 2019]

Skewes, T., Dennis, D., Jacobs, D., Gordon, S., Taranto, T., Haywood, M., Pitcher, C., Smith, G., Milton, D., Poiner, I., 1999a. Survey and Stock Size Estimates of the Shallow Reef (0-15 M Deep) and Shoal Area (15-50 M Deep) Marine Resources and Habitat Mapping Within the Timor Sea MOU74 Box. Volume 1: Stock Estimates and Stock Status. CSIRO Marine Research, Hobart

Skewes, T., Gordon, S., McLeod, I., Taranto, T., Dennis, D., Jacobs, D., Pitcher, C., Haywood, M., Smith, G., Poiner, I., Milton, D., Griffin, D., Hunter, C., 1999b. Survey and Stock Size Estimates of the Shallow Reef (0-15 m Deep) and Shoal Area (15-50 m Deep) Marine Resources and Habitat Mapping within the Timor Sea MOU74 Box. Volume 2: Habitat Mapping and Coral Dieback. CSIRO Marine Research, Hobart.

SKM 2009b. Browse Kimberley LNG DFS#10 – Intertidal Survey. Prepared for Woodside Energy Limited by Sinclair Knight Merz Pty Ltd, Perth, Western Australia

The Ecology Lab 1997. Macroalgal Habitats of the Lowendal/Montebello Island Region. Prepared for Apache Energy Ltd by The Ecology Lab, September 1997

Thomas, L. et al. 2017. Restricted gene flow and local adaptation highlight the vulnerability of high-latitude reefs to rapid environmental change, *Global Change Biology*, 23(6): 2197–2205

Trebilco R, Fischer M, Hunter C, Hobday AJ, Thomas L, Evans K (2021). Marine: Marine ecosystem processes. In: Australia State of the environment 2021, Australian Government Department of Agriculture, Water and the Environment, Canberra, https://soe.dcceew.gov.au/marine/environment/marine-ecosystem-processes, DOI: 10.26194/nvaa-rf92

Underwood, J.N 2009. Genetic diversity and divergence among coastal and offshore reefs in a hard coral depend on geographic discontinuity and oceanic currents: Genetic divergence in a hard coral, *Evolutionary Applications*, 2(2): 222–233

URS 2006. Report on Environmental Surveys Undertaken at Scott Reef in February 2006. Prepared for Woodside Energy Limited by URS Australia Pty Ltd, Perth, Western Australia

URS 2009. Report Annual Marine Monitoring – Macroalgae. Prepared for Apache Energy Ltd by URS Australia Pty Ltd, Perth, Western Australia, August 2009

URS 2010a. Ichthys Gas Field Development Project Studies of the Offshore Marine Environment. Prepared for INPEX Browse Ltd, Perth Western Australia, INPEX Document No. C036-AH-REP-0023

URS 2010b. Benthic Primary Producer (Seagrass and Macroalgae) Habitats of the Wheatstone Project Area. Report R1442. Prepared for Chevron Australia Pty Ltd by URS Australia Pty Ltd, Perth, Western Australia

van Keulen M, Langdon MW 2011. Ningaloo Collaboration Cluster: Biodiversity and ecology of the Ningaloo Reef lagoon. Ningaloo Collaboration Cluster Final Report No. 1c

Vergès A., Vanderklift M. Doropoulos C. and Hyndes G. 2011. Spatial Patterns in Herbivoury on a Coral Reff Are Influenced by Structural Complexity but not by Algal Traits. PloS one. 6. e17115. 10.1371/journal.pone.0017115.

Veron JEN 1986. Reef building corals. In: Berry, P.F. (ed.). Faunal surveys of the Rowley Shoals, Scott Reef and Seringapatam Reef, north-western Australia. Records of the Western Australian Museum, Supplement No. 25:25–35

Veron JEN 1993. Hermatypic corals of Ashmore Reef and Cartier Island. In: Marine Faunal Surveys of Ashmore Reef and Cartier Island, North-western Australia, ed. P.F. Berry. Western Australian Museum, Perth

Veron JEN, Marsh LM 1988. Hermatypic corals of Western Australia; Records and Annotated Species List. Records of the Western Australian Museum, Supplement No. 29. Western Australian Museum, Perth, Western Australia

Walker DI 1989. Seagrass in Shark Bay – the foundations of an ecosystem. In: Seagrasses: A Treatise on the Biology of Seagrass with Special Reference to the Australian Region, eds A W D Larkum, A J McComb, S A Shepherd, Elsevier, Amsterdam, pp.182-210

Walker DI & Prince RIT 1987. Distribution and biogeography of seagrass species on the northwest coast of Australia. Aquatic Botany 29:19–32

Waples K & Hollander E 2008. Ningaloo Research Progress Report: Discovering Ningaloo – latest findings and their implications for management. Ningaloo Research Coordinating Committee, Department of Environment and Conservation, WA

Western Australian Museum (WAM). 2009. A Marine Biological Survey of Mermaid Reef (Rowley Shoals), Scott and Seringapatam Reefs, Western Australia 2006. Edited by C Bryce. Records of the Western Australian Museum Supplement 77.

Wells FE, Walker DI & Jones DS (eds) 2003. The marine flora and fauna of Dampier, Western Australia. Western Australian Museum, Perth, Western Australia

Whiting S 1999. Use of the remote Sahul Banks, North-western Australia, by dugongs, including breeding females. Marine Mammal Science 15: 609–615

Williams A, Dunstan P, Althaus F, Barker B, McEnnulty F, Gowlett-Holmes K & Keith G (2010) Characterising the seabed biodiversity and habitats of the deep continental shelf and upper slope off the Kimberley coast, NW Australia. Report produced for Woodside Energy Ltd. CSIRO, pp. 95

Wilson, DF. 2005. Arafura Sea Biological Survey Report on RV Southern Surveyor Expedition 05/2005., A National Oceans Office, Australian Museum and CSIRO project, Hobart.

Wilson J, Darmawan A, Subijanto J, Green and Sheppard S. 2011. Scientific Design of a Resilient Network of Marine Protected Areas. Lesser Sunda Ecoregion, Coral Triangle. The Nature Conservancy. Asia Pacific Marine Program Report No. 2/11. March 2011

Wilson B 2013. The Biogeography of the Australian North West Shelf: Environmental Change and Life's Response. Elsevier. Western Australian Museum, Perth, Western Australia

Woodside 2011. Browse LNG Development Draft Upstream Environmental Impact Statement. EPBC Referral 2008/4111. Woodside Energy Ltd, Perth, Western Australia, November 2011

Woodside Energy Limited, Australian Institute of Marine Science, Western Australian Museum 2010. Scott Reef Status Report 2010.

## 15.3. Shoreline Habitats

Alongi DM 2002. Present state and future of the world's mangrove forests. Environmental Conservation 29, 331–349. doi:10.1017/S0376892902000231

Alongi DM (2009). The Energetics of Mangrove Forests. Springer.

Astron (2014) Apache OSMP - Desktop Mangrove Assessment. Prepared for Apache Energy Ltd by Astron Environmental Services, Perth, Western Australia, November 2013. Report reference 564-13-1MSR-1Rev0-140225

Astron (2016) Quadrant Environmental Monitoring Program Varanus Island Mangrove Monitoring Annual Report 2016. Prepared for Quadrant Energy Australia Ltd by Astron Environmental Services, Perth, Western Australia, February 2016. Report reference EA-60-RI-10155

Ayukai T (1998) Introduction: carbon fixation and storage in mangroves and their relevance to the global climate change – a case study in Hinchinbrook Channel in North-eastern Australia. Mangroves and Salt Marshes V2 No 4, Kluwer Academic Publishers.

CALM (2005) Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005–2015 Management Plan No. 52. Department of Conservation and Land Management, Western Australia.

CALM, MPRA (2005) Indicative Management Plan for the Proposed Dampier Archipelago Marine Park and Cape Preston Marine Management Area

Chatto R. and Baker, B. 2008. The Distribution and Status of Marine Turtle Nesting in the Northern Territory, Technical Report 77. Parks and Wildlife Commissiong of the Northern Territory, Darwin, Northern Territory.

Cresswell I, Semeniuk V, (2011) Mangroves of the Kimberley coast: ecological patterns in a tropical ria coast setting. Journal of the Royal Society of Western Australia 94, 213–237.

ConocoPhillips, 2020. Barossa Gas Export Pipeline Installation Environment Plan. ConocoPhillips, Western Australia.

DEC (2007) Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves 2007-2017. Management Plan Number 55. Department of Conservation and Land Management, Western Australia.

DEC (2013) Ngari Capes Marine Park management plan 2013– 2023, Management plan number 74. Department of Environment and Conservation, Perth.

DoF (2012) Exploring the Houtman Abrolhos Islands. Published by Department of Fisheries, Perth, Western Australia. Publication No. 105, June 2012.

Duke N, Wood A, Hunnam K, Mackenzie J, Haller A, Christiansen N, Zahmel K, Green T (2010) Shoreline ecological assessment aerial and ground surveys 7-19 November 2009.

Duke NC, Ball MC, Ellison JC (1998) Factors influencing biodiversity and distributional gradients in mangroves. Global Ecology and Biogeography Letters 7, 27–47.

EPA (2001) Guidance Statement for Protection of Tropical Arid Zone Mangroves Along the Pilbara Coastline. Guidance Statement No. 1. Environmental Protection Authority Western Australia Perth

Garnet S.T. and Crowley, G.M. (2000) The action plan for Australian birds 2000. Environment Australia, Canberra.

Gueho, R (2007) Rhythms of the Kimberley: a seasonal journey through Australia's north. Fremantle Press, Australia.

IUCN 2019. The IUCN Red List of Threatened Species. Version 2019-3. http://www.iucnredlist.org. Downloaded on 16 December 2019.

Johnstone R (1984) Intergradation between Lemon-breasted Flycatcher *Microeca flavigaster* Gould and Brown-tailed Flycatcher *Microeca tormenti* Mathews in Cambridge Gulf, Western Australia. Records of the Western Australian Museum 11, 291–295.

Kangas M, McCrea J, Fletcher W, Sporer E and Weir V (2006) Exmouth Gulf Prawn Fishery ESD Report Series No.1 Department of Fisheries Western Australia.

Kathiresan, K., Bingham, B.L., 2001. Biology of mangroves and mangrove ecosystems. Advances in marine biology 40, 81–251.

Kenyon R, Loneragan N, Manson F, Vance D, Venables W (2004). Allopatric distribution of juvenile red-legged banana prawns (*Penaeus indicus* H. Milne Edwards, 1837) and juvenile white banana prawns (*Penaeus*

*merguiensis* De Man, 1888), and inferred extensive migration, in the Joseph Bonaparte Gulf, northwest Australia. Journal of Experimental Marine Biology and Ecology 309, 79–108.

Nagelkerken I, van der Velde G, Gorissen MW, Meijer GJ, Van't Hof T, den Hartog C, 2000. Importance of Mangroves, Seagrass Beds and the Shallow Coral Reef as a Nursery for Important Coral Reef Fishes, Using a Visual Census Technique. Estuarine, Coastal and Shelf Science 51, 31–44. doi:10.1006/ecss.2000.0617

NOAA (2010) Oil Spills in Mangroves, Planning and Response. National Oceanic and Atmospheric Administration. US Department of Commerce, Office of Response and Restoration.

Pedretti YM, Paling EI (2001) WA Mangrove Assessment Project 1999-2000. Marine and Freshwater Research Laboratory, Murdoch University, Perth, Western Australia.

Rule M, Kendrick A, Huisman J (2012) Mangroves of the Shark Bay Marine Park. Information Sheet 46/2012 Science Division. Department of Environment and Conservation.

Semeniuk V (1993) The mangrove systems of Western Australia: 1993 Presidential Address. Journal of the Royal Society of Western Australia 76:99-122.

URS 2010. Ichthys Gas Field Development Project Studies of the Offshore Marine Environment. Prepared for INPEX Browse Ltd, Perth Western Australia, INPEX Document No. C036-AH-REP-0023

Waples K (2007) Kimberley Biodiversity Review. WAMSI. Western Australia.

Wilson B, 1994. A representative Marine Reserve System for Western Australia.

Wilson B (2013) The Biogeography of the Australian North West Shelf: Environmental Change and Life's Response. Elsevier.

Zell L (2007) Kimberley Coast. Wild Discovery.

## 15.4. Intertidal Habitats

Barter M (2002) Shorebirds of the Yellow Sea: importance, threats and conservation status. Australian Government Publishing Service, Canberra, Australia.

Bennelongia Pty Ltd (2010) Analysis of possible change in ecological character of the Roebuck Bay and Eighty Mile Beach Ramsar sites.

BirdLife International (2018) Important Bird Areas Data Zone [Online]. Available from: http://www.birdlife.org [Accessed December 2018]

CALM (1996) Shark Bay Marine Reserves. Management Plan. 1996-2006. Marine Conservation Branch, Management Plan No. 34. Department of Conservation and Land Management, Western Australia.

DPaW 2013. Lalang-garram / Camden Sound Marine Park management plan no. 73 2013–2023, Department of Parks and Wildlife, Perth, Western Australia.

Department of Sustainability, Environment, Water, Population and Communities (2013a) Conservation Advice for Subtropical and Temperate Coastal Saltmarsh. Department of Sustainability, Environment, Water, Population and Communities.

DSEWPaC (2013b) World Heritage Places – Shark Bay, Western Australia. Available at: https://www.environment.gov.au/heritage/places/world/shark-bay [Accessed 17 July 2013]

Duke N, Wood A, Hunnam K, Mackenzie J, Haller A, Christiansen N, Zahmel K, Green T (2010) Shoreline ecological assessment aerial and ground surveys 7-19 November 2009.

Garnet ST and Crowley GM (2000) The action plan for Australian birds 2000. Environment Australia Canberra.

Gibson, L. and Wellbelove, A (2010) Protecting critical marine habitats: The key to conserving our threatened marine species: a Humane Society International and WWF-Australia Report.

Hanley JR and Morrison PF (2012) A Guide to the intertidal flora and fauna of the Point Samson Fish Reserve. Sinclair Knight Merz and Rio Tinto Australia Pty Ltd.

IUCN 2019. The IUCN Red List of Threatened Species. Version 2019-3. http://www.iucnredlist.org. Downloaded on 16 December 2019.

Jones DS (2004) Marine biodiversity of the Dampier Archipelago Western Australia 1998-2002.

Masini R, Sim C, Simpson C (2009) Protecting the Kimberley: A synthesis of scientific knowledge to support conservation management in the Kimberley region of Western Australia.

Robertson, A.I., 1988. Decomposition of mangrove leaf litter in tropical Australia. Journal of Experimental Marine Biology and Ecology 116, 235–247. doi:10.1016/0022-0981(88)90029-9

Robson BJ, Burford M, Gehrke P, Revill A, Webster I, Palmer D (2008) Response of the lower Ord River and estuary to changes in flow and sediment and nutrient loads (Water for a Healthy Country Flagship Report). CSIRO.

Wade S, Hickey R, (2008). Mapping Migratory Wading Bird Feeding Habitats using Satellite Imagery and Field Data, Eighty-Mile Beach, Western Australia. Journal of Coastal Research 243, 759–770. doi:10.2112/05-0453.1

Wilson B, 1994. A representative Marine Reserve System for Western Australia.

Wilson B (2013) The Biogeography of the Australian North West Shelf: Environmental Change and Life's Response. Elsevier.

Zell L (2007) Kimberley Coast. Wild Discovery.

## 15.5. Fish and Sharks

Allen, GR. (1989). Fishes. In Survey of the Marine Fauna of Cocos (Keeling) Islands, Indian Ocean. (Ed. P.F. Berry). (Western Australian Museum: Perth, Western Australia).

BBG (1994) Dampier Port Authority, Environmental Management Plan. Report prepared by Bowman Bishaw Gorham Perth, for the Dampier Port Authority, Dampier.

Borrell A, Aguilar A, Gazo M, Kumarran RP, Cardona L 2011. Stable isotope profiles in whale shark (Rhincodon typus) suggest segregation and dissimilarities in the diet depending on sex and size. Environmental Biology of Fishes, 92: 559-567.

Bradshaw CJA, Mollet HF, Meekan MG 2007. Inferring population trends for the world's largest fish from mark-recapture estimates of survival. Journal of Animal Ecology 76: 480-489

Brewer DT, Lyne V, Skewes TD and Rothlisberg P 2007. Trophic Systems of the North West Marine Region. Prepared for the Department of the Environment, Water, Heritage and the Arts by CSIRO Marine and Atmospheric Research, Cleveland, Australia.

Bulman C (2006) Trophic Webs and Modelling of Australia's North West Shelf. North West Shelf Joint Environmental Management Study: Technical Report No. 9. CSIRO Marine and Atmospheric Research, Hobart, Tasmania, CSIRO Marine and Atmospheric Research.

CALM (1996) Shark Bay Marine Reserves. Management Plan. 1996-2006. Marine Conservation Branch, Management Plan No. 34. Department of Conservation and Land Management.

CALM (2005) Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005 – 2015 Management Plan No. 52. Department of Conservation and Land Management, Perth, Western Australia.

Cailliet, G.M. (1996). An Evaluation of Methodologies to Study the Population Biology of White Sharks. In: Klimley, A.P. & D.G. Ainley, eds. Great White Sharks The biology of Carcharodon carcharias. Page(s) 415-416. United States of America: Academic Press Limited.

Chen C-T, Liu K-M, Joung S-J (1997) Preliminary report on Taiwan's whale shark fishery. Traffic Bulletin, 17: 53-57.

Chevron 2011. Technical Appendix 06 Draft Marine Fauna Management Plan. Appendix D: Sawfish Management Summary Report. Document No. WS0-0000-HES-PLN-CVX-000-00037-000. Rev E

Chidlow J, Gaughan D and McAuley RB (2006) Identification of Western Australian Grey Nurse Shark aggregation sites. Final report to the Australian Government, Department of the Environment and Heritage. Fisheries research report No. 155. Department of Fisheries, Western Australia, 48p.

CITES (2004). Convention of International Trade in Endangered Species of Wild Fauna and Flora - Appendix II Listing of the White Shark (revision 1). Available from: https://www.environment.gov.au/system/files/resources/2a4abfb5-236c-43bf-ad9d-b6d29c507f04/files/great-white-cites-appendix2-english.pdf [accessed February 2020].

Clark, E and Nelson, D. (1997). Young whale sharks, *Rhincodon typus*, feeding on a copepod bloom near La Paz, Mexico. Environmental Biology of Fishes. 50. 63-73. 10.1023/A:1007312310127.

Commonwealth of Australia, 2015. Sawfish and River Sharks Multispecies Recovery Plan. Available from: http://www.environment.gov.au/system/files/resources/062794ac-ef99-4fc8-8c18-6c3cd5f6fca2/files/sawfish-river-sharks-multispecies-recovery-plan.pdf. [Accessed 24 February 2020].

Compagno, L J (2001) Sharks of the World: An Annotated and Illustrated Catalogue of Shark Species Known to Date. Vol. 2, Bullhead, Mackerel and Carpet Sharks (Heterodontiformes, Lamniformes and Orectolobiformes) (Vol. 2, No. 1). Food & Agriculture Org.

Compagno, LJV & Last, PR 1999. Order Pristiformes. Pristidae: sawfishes, in KE Carpenter & VH Niem (eds), FAO species identification guide for fishery purposes – the living marine resources of the western central Pacific, vol. 3, Batoid fishes, chimaeras and bony fishes, part 1 (*Elopidae* to *Linophyroidae*), FAO, Rome, pp. 1410–1417.

de Lestang P & Jankowski A (2017). A Guide to the Common Marine Fishes of Barrow Island. Chevron. Available from: https://australia.chevron.com/-/media/australia/publications/documents/nature-book-fish.pdf [Accessed 26/02/20].

DBCA. (2014). Eighty Mile Beach Marine Park Management Plan 2014-2024. https://maps.northwestatlas.org/files/montara/links_to_plans/WA/1.%20EIGHTY_MILE_BEACH_MGT_PLAN_V12%20Ngarla-Nyanguarta-Karajarri.pdf

DCCEEW. (2024c). *Thunnus maccoyii* — Southern Bluefin Tuna. https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=69402

DCCEEW. (2024d). Listing Advice for *Sphyrna lewini* (scalloped hammerhead). https://www.environment.gov.au/biodiversity/threatened/species/pubs/85267-listing-advice-27022024.pdf

DCCEEW. (2024e). *Galeorhinus galeus* — School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark. https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=68453

DEC (2007a) Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves 2007–2017: Management Plan No. 55. Department of Environment and Conservation, Perth, Western Australia.

DEC (2007b) Management Plan for the Rowley Shoals Marine Park 2007–2017: Management Plan No. 56. Department of Environment and Conservation, Perth, Western Australia

DEH (2006) A Guide to the Integrated Marine and Coastal Regionalisation of Australia Version 4.0. Department of the Environment and Heritage, Canberra, Australia.

DEWHA (2008a) The north-west marine region bioregional profile: a description of the ecosystems, conservation values and uses of the north-west marine region, Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA), Canberra.

DEWHA (2008b). The South-west Marine Bioregional Plan: Bioregional profile: A Description of the Ecosystems, Conservation Values and Uses of the South-West Marine Region. Department of the Environment Water, Heritage and the Arts, Canberra, Australian Capital Territory

DEWHA (2009) DEWHA Fact Sheet – Three sharks listed as migratory species under the EPBC Act. Department of the Environment, Water, Heritage and the Arts, Canberra, Australia.

DEWHA (2012a) Species group report card – bony fishes. Supporting the marine bioregional plan for the North-west Marine Region. Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA), Canberra.

DEWHA (2012b) Species group report card – sharks and saw fishes. Supporting the marine bioregional plan for the North-west Marine Region. Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA), Canberra.

DoE (2014b) *Pristis clavata* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 18 Mar 2014

DoE (2014c) *Pristis pristis* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 25 Mar 2014

DoE (2014c) *Pristis zijsron* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 25 Mar 2014

DoE (2015) Approved Conservation Advice *Rhincodon typus* (whale shark). Threatened Species Scientific Committee, Department of the Environment, Canberra, Australian Capital Territory

DoEE (2016a). *Nannatherina balstoni* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 2 Aug 2016

DoF (2012) Exploring the Houtman Abrolhos Islands. Published by Department of Fisheries, Perth, Western Australia. Publication No. 105, June 2012.

DSEWPaC (2012) Marine Bioregional Plan for the North-west Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Capital Territory

Eckert, S.A, and Stewart, B. S. (2001) Telemetry and satellite tracking of whale sharks, *Rhincodon typus*, in the sea of Cortez, Mexico, and the north Pacific Ocean. Environmental Biology of Fishes 60: 299-308.

Fletcher, WJ. and Santoro, K. (2013). Status Reports of the Fisheries and Aquatic Resources of Western Australia 2012/13(eds). The State of the Fisheries. Department of Fisheries, Western Australia.

Fox, NJ and Beckley, LE (2005). Priority areas for conservation of Western Australian coastal fishes: A comparison of hotspot, biogeographical and complementarity approaches. Biological Conservation, 125: 399-410.

Gelsleichter J, Musick JA & Nichols S (1999). Food habits of the smooth dogfish, *Mustelus canis*, dusky shark, *Carcharhinus obscurus*, Atlantic sharpnose shark, *Rhizoprionodon terraenovae*, and the sand tiger, *Carcharias taurus*, from the northwest Atlantic Ocean, Environmental Biology of Fishes, vol. 54, pp. 205–217.

Hutchins JB (2003). Checklist of marine fishes of the Dampier Archipelago, Western Australia. Pp. 453-478. In: Wells, F.E., Walker D.I. & Jones D.S. (eds). *The Marine Flora and Fauna of Dampier, Western Australia*. Western Australian Museum, Perth.

Hutchins JB (2004) Fishes of the Dampier Archipelago, Western Australia pp. 343-398. In: Jones D.S. (ed). Report on the results of the Western Australia Museum/Woodside Energy Ltd. Partnership to explore the Marine Biodiversity of the Dampier Archipelago. Western Australia 1998-2002. Records of the Western Australian Museum Supplement No. 66: 343-398.

IUCN 2019. The IUCN Red List of Threatened Species. Version 2019-3. http://www.iucnredlist.org. Accessed 16 December 2019.

Jarman SN, Wilson SG (2004) DNA-based species identification of krill consumed by whale sharks. *Journal of Fish Biology*, 65: 586-591

Kemps, H (2010) Ningaloo: Australia's Untamed Reef. Quinns Rocks: MIRG Australia

Kospartov, M., Beger, M., Ceccarelli, D., and Richards, Z. (2006). An assessment of the distribution and abundance of sea cucumbers, trochus, giant clams, coral, fish and invasive marine species at Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve: 2005. Report prepared by UniQuest Pty Ltd for the Department of the Environment and Heritage, Canberra, ACT.

Last P, Lyne V, Yearsley G, Gledhill D, Gomon M, Rees T and White, W (2005) Validation of national demersal fish datasets for the regionalisation of the Australian continental slope and outer shelf (>40 m depth). Department of Environment and Heritage and CSIRO Marine Research, Australia. 99pp

Last PR & Stevens JD (2009) Sharks and rays of Australia, 2nd edn, CSIRO Publishing, Collingwood.

Mackie M, Nardi A, Lewis P and Newman S (2007) Small Pelagic Fishes of the North-west Marine Region, Prepared for the Department of the Environment and Water Resources by Department of Fisheries, Perth, Western Australia.

Marcus, L., Virtue, P, Pethybridge, HR,. Meekan, MG, Thums, M & Nichols, PD. (2016).Intraspecific Variability in Diet and Implied Foraging Ranges of Whale Sharks at Ningaloo Reef, Western Australia, from Signature Fatty Acid Analysis. Marine Ecology Progress Series554: 115–28

Meekan MG, Bradshaw CJA, Press M, McLean C, Richards A, Quasnichka S, Taylor JA (2006) Population size and structure of whale sharks (*Rhincodon typus*) at Ningaloo Reef, Western Australia. Marine Ecology Progress Series 319: 275-285

Meekan MG, Jarman SN, McLean C, Schultz MB (2009) DNA evidence of whale sharks (*Rhincodon typus*) feeding on red crab (*Gecarcoidea natalis*) larvae at Christmas Island, Australia. Marine and Freshwater Research 60: 607-609

Meekan, MG, Virtue, P, Marcus, L, Clements, KD, Nichols, PD & Revill, AT. (2022). The world's largest omnivore is a fish. *Ecology* (Durham) e3818.

Newman, S.J., Wise, B.S., Santoro, K.G. and Gaughan, D.J. (eds). 2023. Status Reports of the Fisheries and Aquatic Resources of Western Australia 2021/22: The State of the Fisheries. Department of Primary Industries and Regional Development, Western Australia.

Norman, B (2005) *Rhincodon typus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Accessed 31 May 2013.

Norman M and Reid A (2000). A guide to squid, cuttlefish and octopuses of Australasia. CSIRO Publishing.

Norman, B.M. and Stevens, JD (2007) Size and maturity status of the whale shark (*Rhincodon typus*) at Ningaloo Reef in Western Australia. Fisheries Research, 84: 81-86.

Otway NM, & PC Parker (2000) The Biology, Ecology, Distribution, Abundance and Identification of Marine Protected Areas for the Conservation of Threatened Grey Nurse Sharks in South-east Australian Waters. NSW Fisheries Office of Conservation.

Peverell SC (2005) Distribution of sawfishes (Pristidae) in the Queensland Gulf of Carpentaria, Australia, with notes on sawfish ecology, Environmental Biology of Fishes, vol. 73, pp. 391–402.

Pierce, SJ., Pardo, SA., Rohner, CA., Matsumoto, R., Murakumo, K., Nozu, R. & Meekan, M.G. (2021). Whale Shark Reproduction, Growth, and Demography. Whale Sharks: Biology, Ecology, and Conservation.

Pogonoski JJ, DA Pollard & JR Paxton (2002) Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes. [Online]. Canberra, ACT: Environment Australia. Available from: https://www.environment.gov.au/system/files/resources/ca415225-5626-461c-a929-84744e80ee36/files/marine-fish.pdf [Accessed February 2020].

Pollard, DA MP Lincoln-Smith & A.K. Smith (1996) The biology and conservation of the grey nurse shark (*Carcharias taurus* Rafinesque 1810) in New South Wales, Australia. Aquatic Conservation: Marine and Freshwater Ecosystems. 6.

Rowat, D & KS Brooks. (2012). A Review of the Biology, Fisheries and Conservation of the Whale Shark Rhincodon Typus. *Journal of fish biology*, 80(5).

Russell, B., Larson, H., Hutchins, J., and Allen, G.R. (2005). Reef Fishes of the Sahul Shelf. In Understanding the Cultural and Natural Heritage Values and Management Challenges of the Ashmore Region, Proceedings of a Symposium organised by the Australian Marine Sciences Association and the Museum and Art Gallery of the Northern Territory, Darwin, 4-6 April 2001. Edited by B. Russell, H. Larson, C.J. Glasby, R.C. Willan, and J. Martin. Museum and Art Galleries of the Northern Territory & Australian Marine Sciences Association, Darwin, Northern Territory. pp. 83–105.

Sainsbury KJ, Campbell RA and Whitlaw AW (1992) Effects of trawling on the marine habitat on the North West Shelf of Australia and implications for sustainable fisheries management. In: Hancock D. A. (Editor). *Sustainable Fisheries through Sustaining Fish Habitat*. Canberra Australia. Australian Government Publishing Service, 1993, 137–145. Aust Soc. for Fish. Biol. Workshop, Victor Harbour, SA, 12–13 August 1992.

Smale MJ (2005) The diet of the ragged-tooth shark *Carcharias taurus* Rafinesque 1810 in the Eastern Cape, South Africa, African Journal of Marine Science, vol. 27, pp. 331–335.

Stevens JD, McAuley RB, Simpfendorfer CA & Pillans RD (2008) Spatial distribution and habitat utilisation of sawfish (Pristis spp) in relation to fishing in northern Australia, report to the Australian Government Department of Environment and Heritage, Canberra.

Stevens JD, Pillans, RD and Salini J (2005) Conservation Assessment of *Glyphis sp.* A (Speartooth Shark), *Glyphis sp.* C (Northern River Shark), *Pristis microdon* (Freshwater Sawfish) and *Pristis zijsron* (Green Sawfish). [Online]. Hobart, Tasmania: CSIRO Marine Research. Available from: https://www.environment.gov.au/system/files/resources/d1696b5b-6a2e-4920-a3e2-16e5a272349a/files/assessment-glyphis.pdf [Accessed February 2020].

Thorburn DC, DL Morgan, AJ Rowland & HS Gill (2007) Freshwater sawfish *Pristis microdon* Latham, 1794 (Chondrichthyes: Pristidae) in the Kimberley region of Western Australia. *Zootaxa*. 1471:27-41.

Thorburn, DC, Morgan, DL, Rowland, AJ & Gill HS (2004) The northern river shark (*Glyphis sp*. C) in Western Australia, Report to the National Trust

Tyminski, John P et al. (2015). Vertical Movements and Patterns in Diving Behavior of Whale Sharks as Revealed by Pop-Up Satellite Tags in the Eastern Gulf of Mexico: *PloS one*, 10(11).

Whisson, G & Hoshke, A (2013). *In situ* video monitoring of finfish diversity at Ningaloo Reef, Western Australia. Galaxea, Journal of Coral Reef Studies. The Japanese Coral Reef Society. Vol. 15, pp 72-28

Wilson, S Polovina, J Stewart, B & Meekan, M (2006) Movements of whale sharks (*Rhincodon typus*) tagged at Ningaloo Reef. Marine Biology, vol. 147, pp. 1157-1166.

Womersley, Freya C et al. (2022) Global Collision-Risk Hotspots of Marine Traffic and the World's Largest Fish, the Whale Shark. Proceedings of the National Academy of Sciences, 119(20).

## 15.6. Marine Reptiles

Ferreira, Luciana, C & Thums, Michele & Fossette, Sabrina & Wilson, Phillipa & Shimada, Takahiro & Tucker, Anton & Pendoley, Kellie & Waayers, Dave & Guinea, Michael & Loewenthal, Graham & King, Joanne & Speirs, Marissa & Rob, Dani & Whiting, Scott. (2020). Multiple satellite tracking datasets inform green turtle conservation at a regional scale. Diversity and Distributions. 27. 249-266. 10.1111/ddi.13197.

Fukuda, Y., P. Whitehead & G. Boggs (2007). Broad-scale environmental influences on the abundance of saltwater crocodiles (Crocodylus porosus). Australia. Wildlife Research. 34:167-176.

AIMS (Australian Institute of Marine Science). (2021). Hawksbill and green turtle distribution and important areas. As part of the Northwest Shores to Shoals Research Program, supported by Santos. Available at: https://northwestatlas.org/nwa/nws2s-megafauna#green_bia

Astron (2017) Quadrant Environmental Monitoring Program Varanus and Airlie Islands Turtle Monitoring Annual Report 2016/17, Prepared for Quadrant Energy Australia Ltd by Astron Environmental Services, Perth, Western Australia, June 2017. Report reference EA-60-RI-10173.

Astron Environmental Services (2013a) Exmouth Islands Turtle Monitoring Program – Desktop Review and Gap Analysis. Rev B, 26 September 2013, unpublished report for Apache Energy Ltd, Perth.

Astron Environmental Services (2014) Exmouth Islands Turtle Monitoring Program – January 2014 Field Survey. Rev A, 11 February 2014, unpublished report for Apache Energy Ltd, Perth.

Baldwin R, Hughes GR and Prince RIT (2003) Loggerhead turtles in the Indian Ocean. In: AB Bolten and BE Witherington (eds) Loggerhead Sea Turtles, Smithsonian Books, Washington.

BHPB (2005) Pyrenees Development: Draft Environmental Impact Statement. BHP Billiton, Perth, Western Australia.

CALM (2005a) Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005 – 2015 Management Plan No. 52. Department of Conservation and Land Management, Perth, Western Australia.

Chaloupka M and Prince RIT (2012) Estimating demographic parameters for a critically endangered marine species with frequent reproductive omission: Hawksbill turtles nesting at Varanus Island, Western Australia. Marine Biology 159(2): 355-363.

Chevron (2005) Environmental Impact Statement/Environmental Review and Management Programme for the proposed Gorgon Development. Chevron Australia Pty Ltd, Perth, Western Australia.

Chevron (2008) Gorgon Gas Development Revised and Expanded Proposal Public Environmental Review Operated by Chevron Australia in joint venture with Gorgon Project. EPBC Referral 2008/4178Assessment No. 1727. Chevron Australia Pty Ltd, Perth, Western Australia, September 2008.

Cogger HG (2000) Reptiles and Amphibians of Australia - 6th edition. Sydney, NSW: Reed New Holland

Commonwealth of Australia (2017a), Recovery Plan for Marine Turtles in Australia 2017 – 2027.

DCCEEW (2024b) Conservation Advice for *Aipysurus fuscus* (dusky seansnake) September 2024.

DEC (2009a) Management Plan for the Commercial Harvest and Farming of Crocodiles in Western Australia 1 January 2009-31 December 2013.

DEWHA (2008a) The North-west Marine Bioregional Plan: Bioregional profile: A Description of the Ecosystems, Conservation Values and Uses of the North-West Marine Region. Department of the Environment Water, Heritage and the Arts, Canberra, ACT.

DoE (2014) *Aipysurus foliosquama* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id= 1118. Accessed 23 July 2014

DoEE (2019) Species Profile and Threats Database [Online] Department of Environment and Energy Canberra, Commonwealth of Australia Available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

DSEWPaC (2012a) *Eretmochelys imbricata* – Hawksbill Turtle. Available from: http://www.environment.gov.au/ cgibin/sprat/public/publicspecies.pl?taxon_id=1766. Department of Sustainability, Environment, Water, Population and Communities.

DSEWPaC (2012b) Marine bioregional plans. Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT. Available at http://www.environment.gov.au/marine/marine-bioregional-plans/ about

DSEWPaC (2012c) *Natator depressus* – Flatback Turtle. Available from: http://www.environment.gov.au/cgi-bin/ sprat/public/publicspecies.pl?taxon_id=59257. Department of Sustainability, Environment, Water, Population and Communities.

DSEWPaC (2012d) Species Group Report Card – Reptiles. Supporting the draft marine bioregional plan for the North-west Marine Region. Department of Sustainability, Environment, Water, Populations and Communities, Canberra, Australia.

Fossette, S, Ferreira, LC, Whiting, SD, Pendoley, JKK, Shimada, T, Speirs, M, Tucker, AD, Wilson, P & Thums, M. (2021). Movements and distribution of hawksbill turtles in the Eastern Indian Ocean. *Global Ecology and Conservation,* 29. e01713.

Guinea ML & SD Whiting (2005) Insights into the distribution and abundance of sea snakes at Ashmore Reef. The Beagle (Supplement 1). Page(s) 199-206

Hamann, M, Jessop, T. Limpus, C. and Whittier, J.M. (2002). Interactions among endocrinology, seasonal reproductive cycles and the nesting biology of the female green sea turtle. Marine Biology. 140. 823-830. 10.1007/s00227-001-0755-8.

Heatwole H and Cogger HG (1993). Family Hydrophiidae, in: Glasby CG, Ross GJB and Beesley PL (eds) Fauna of Australia Volume 2A: Amphibia and Reptilia. AGPS Canberra. 439pp

Keesing, J.K. (Ed.) 2019. Benthic habitats and biodiversity of the Dampier and Montebello Australian Marine Parks. Report for the Director of National Parks. CSIRO, Australia.

Kendall WL and Bjorkland R (2001) Using open robust design models to estimate temporary emigration from capture - recapture data. Biometrics: 57,1113 – 1122.

Limpus C.J and McLachlin N (1994) The conservation status of the Leatherback Turtle, *Dermochelys coriacea*, in Australia. In: James R (ed.) Proceedings of the Australian Marine Turtle Conservation Workshop, Gold Coast 14-17 November 1990. pp. 63-67. Queensland Department of Environment and Heritage. Canberra: ANCA.

Limpus CJ (2007) A biological review of Australian marine turtle species. 5. Flatback turtle*, Natator depressus* (Garman). The State of Queensland. Environmental Protection Agency, Brisbane, Queensland.

Limpus CJ (2008a) A biological review of Australian marine turtle species. 2. Green turtle, *Chelonia mydas* (Linneaus). The State of Queensland. Environmental Protection Agency, Brisbane, Queensland.

Limpus CJ (2008b) A biological review of Australian marine turtle species. 1. Loggerhead turtle, *Caretta caretta* (Linneaus). The State of Queensland. Environmental Protection Agency, Brisbane, Queensland.

Limpus CJ (2009b) *A Biological Review of Australian Marine Turtles*, Queensland Environmental Protection Agency, Queensland.

Limpus CJ (2009c) A biological review of Australian marine turtle species. 6. Leatherback turtle, *(Dermochelys coriacea*). The State of Queensland. Environmental Protection Agency, Brisbane, Queensland.

Limpus CJ 2009a. A biological review of Australian marine turtle species.3. Hawksbill turtle, *Eretmochelys imbricata* (Linneaus). The State of Queensland. Environmental Protection Agency, Brisbane, Queensland.

Limpus, C. and N. Nicholls. 1994. Progress report on the study of the interaction of the El Nino Southern Oscillation on annual Chelonia mydas numbers at the Southern Great Barrier Reef rookeries. Australian Marine Turtle Conservation Workshop. Queensland Dept of Environment and Heritage Australian Nature Conservation Agency, Sea World, Nara Resort, Gold Coast.

Limpus, C. J. and N. Nicholls. 1988. The Southern Oscillation Regulates the Annual Numbers of Green Turtles (Chelonia-Mydas) Breeding Around Northern Australia. Wildlife Research 15: 157- 161.

McCosker JE (1975). Feeding behaviour of Indo-Australian Hydrophiidae. In: Dunson W A (eds.) The Biology of Sea Snakes. Page(s) 217-232. Baltimore: University Park Press

McMahon, CR, Bradshaw, JA & Hays, GC. (2007). Satellite tracking reveals unusual diving characteristics for a marine reptile, the olive ridley turtle *Lepidochelys olivacea*. Marine Ecology Progress Series. 329:239-252.

Minton S and H Heatwole (1975) Sea snakes from three reefs of the Sahul Shelf. Chapter 5 (pp. 141-144) In: Dunson W A (eds.) The Biology of Sea Snakes, University Park Press, Baltimore, 530 pp.

Minton SA & Heatwole H (1975) Sea snakes from three reefs of the Sahul Shelf. In: Dunson, W. A., ed. The Biology of Sea Snakes. Page(s) 141-144. Baltimore: University Park Press.

Morris K (2004) Regional significance of marine turtle rookeries on the Lowendal Islands. Unpublished information provided to Apache Energy Ltd.

Northern Territory Government (n.d.) Threatened Species of the Northern Territory Green Turtle Chelonia mydas. The Northern Territory Government, Northern Territory.

Oliver GA (1990) Interim Guidelines for Operations – Serrurier Island Nature Reserve. Department of Conservation and Land Management, Perth, Western Australia.

Pendoley Environmental (2009) Marine Turtle Beach Survey: Forty Mile Beach Area, North East and South West Regnard Island. Report to Apache Energy Ltd.

Pendoley Environmental (2011) Varanus Island Marine Turtle Tagging Programme 2009 - 2010. Report to Apache Energy Ltd.

Pendoley Environmental (2013) Varanus Island Marine Turtle Tagging Program 2012 – 2013 Season. Report to Apache Energy Ltd.

Pendoley Environmental (2019) Varanus Island Turtle Monitoring Report: Annual Report 2018/19. Unpublished report for Santos Ltd.

Pendoley KL (2005) Sea Turtles and the Environmental Management of Industrial Activities in North West Western Australia, PhD Thesis, Murdoch University, Australia. 310pp.

Pendoley KL, Bell CD, McCracken R, Ball KR, Sherborne J, Oates JE, Becker P, Vitenbergs A, Whittock PA (2014b) Reproductive biology of the flatback turtle (Natator depressus) at three previously undescribed rookeries in Western Australia. Endang Species Res 23:115–123. doi 10.3354/esr00569

Pendoley, KL, Schofield, G., Whittock, P. A., Ierodiaconou, D., & Hays, G. C. (2014a). Protected species use of a coastal marine migratory corridor connecting marine protected areas. Marine Biology, 1-12.

Polovina, JJ, Balazs, GH, Howell, EA, Parker, DM, Seki, MP & Dutton, PH. (2004). Forage and migration habitat of logger-head (Caretta caretta) and olive ridley (Lepidochelys olivacea) sea turtles in the central North Pacific Ocean. *Fish Oceanogr,* 13:36–51.

Prince RIT (1994) Status of the Western Australian Marine Turtle Populations: The Western Australian Marine Turtle Project 1986–1990. Report prepared for the Queensland Department of Environment and Heritage and Australian Nature Conservation Agency.

Solow, Andrew & Bjorndal, Karen & Bolten, Alan (2002). Annual Variation in Nesting Numbers of Marine Turtles: The Effect of Sea Surface Temperature on Re-migration Intervals. Ecology Letters. 5. 742 – 746. 10.1046/j.1461-0248.2002.00374.x.

Storr GM, Smith LA and Johnstone RE (1986) Snakes of Western Australia. First edition. Perth: Western Australian Museum.

Waayers D (2010) A Holistic Approach to Planning for Wildlife Tourism: A Case Study of Marine Turtle Tourism and Conservation in the Ningaloo Region, Western Australia. PhD Thesis, Murdoch University, Perth.

Waayers, D and Stubbs, J. (2016) A Decade of Monitoring Flatback Turtles in Port Hedland, Western Australia, 2004/05 – 2013/14. Prepared for Care for Hedland Environmental Association, Port Hedland, Western Australia.

Woodside (2002) WA-271-P Field Development: Environmental Impact Statement. Woodside Energy Ltd., Perth.

## 15.7. Marine Mammals

Bannister, J.L., C.M. Kemper & R.M. Warneke (1996). *The Action Plan for Australian Cetaceans*. Canberra: Australian Nature Conservation Agency. Available from: http://www.environment.gov.au/resource/action-plan-australian-cetaceans.

Bejder M, Johnston D.W., Smith J, Friedlaender A, Bejder L (2016) Embracing conservation success of recovering humpback whale populations: Evaluating the case for downlisting their conservation status in Australia. Marine Policy 66 (2016) 137–141.

Branch TA, Stafford KM, Palacios DM, Allison C, Bannister JL, Burton CLK, Cabrera E, Carlson CA, Galletti vernazzani B, Gill PC, Hucke-gaete R, Jenner KC, Jenner M-N, Matsuoka K, Mikhalev YA, Miyashita MG, Morrice S, Nishiwaki VJ, Sturrock D, Tormosov RC, Anderson AN, Baker PB, Best P, Borsa T, Brownell Jr. RL, Childerhouse SK, Findlay P, Gerrodette, T, Ilangakoon, AD, Joergensen, M, Kahn, B, Ljungblad, DK, Maughan, B, Mccauley, RD, Mckay, S, Norris, TF, Oman whale and Dolphin research group, Rankin, S, Samaran, F, Thiele, D, Van Waerebeek K & Warneke RM (2007) Past and present distribution, densities and movements of blue whales *Balaenoptera musculus* in the Southern Hemisphere and Northern Indian Ocean. Mammal Rev. 37(2):116–175

Campbell R (2005) Historical distribution and abundance of the Australian sea lion (*Neophoca cinerea*) on the west coast of Western Australia. Fisheries Research Report no. 148. Department of Fisheries, Perth, Western Australia

Cerchio, S. et al. (2020). A new blue whale song-type described for the Arabian sea and western Indian Ocean. Endanger. Species Res. 43, 495–515

ConocoPhillips 2018. Barossa Area Development Offshore Project Proposal. ConocoPhillips, Perth, Western Australia

DAWE (2020) National Conservation Values Atlas [Online] Department of Environment and Energy Canberra, Commonwealth of Australia Available from: http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf

DAWE (2021) *Xeromys myoides* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat. Accessed Fri, 18 Jun 2021.

DEWHA (Department of the Environment, Water, Heritage and the Arts) (2010a) Blue, Fin and Sei Whale Recovery Plan 2005 - 2010. [Online] Department of the Environment and Heritage Canberra, Commonwealth of Australia Available from: https://www.environment.gov.au/system/files/resources/7dc702c7-80c8-4df5-84b6-cfcbc1da5561/files/cetaceans-assessment.pdf

DEWHA (Department of the Environment, Water, Heritage and the Arts) (2008) The South-West Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems, Conservation Values and Uses of the South-West Marine Region. [Online] Canberra: DEWHA Available from: https://parksaustralia.gov.au/marine/pub/scientific-publications/archive/south-west-marine-bioregional-plan.pdf

DEWR (Department of Environment and Water Resources) (2007) Whales and dolphins identification guide. Department of Environment and Water Resources, Canberra. http://www.environment.gov.au/system/files/resources/9c058c02-afd1-4e5d-abff-11cac2ebc486/files/blue-whale-conservation-management-plan.pdf.

Department of the Environment (DoE) (2015) Conservation Management Plan for the Blue Whale. A Recovery Plan under the *Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment. Canberra.

DoEE (2016a). *Sousa sahulensis*— Indo-Pacific Humpback Dolphin. Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=50 [Accessed on 3 August 2016]

DoEE (2016b). *Tursiops aduncus* — Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin. Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=68418 [Accessed on 3 August 2016]

DoEE (2016c) *Orcaella heinsohni* — Australian Snubfin Dolphin. Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=81322 [Accessed on 3 August 2016]

Department of Agriculture, Water and the Environment (DAWE) (2020a) Species Profile and Threats Database [Online]. Department of Agriculture, Water and the Environment. Canberra, Commonwealth of Australia. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Department of Agriculture, Water and the Environment (DAWE) (2020b) National Conservation Values Atlas [Online]. Department of Agriculture, Water and the Environment. Canberra, Commonwealth of Australia. Available from: http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf

Department of State Development (DSD) 2010. Browse Liquified Natural Gas Precinct – Strategic Assessment Report. Part 3 – Environmental Assessment - Marine Impacts. December 2010

Double MC, Andrews-Goff V, Jenner KCS, Jenner M-N, Laverick SM, Branch TA & Gales N (2014) Migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia as revealed by satellite telemetry. PLOS one, April 2014 9(4)

Double, M.C. et al. (2014) Migratory Movements of Pygmy Blue Whales (Balaenoptera musculus brevicauda) between Australia and Indonesia as Revealed by Satellite Telemetry, PLOS one, 9(4)

Double MC, Gales N, Jenner KCS & Jenner M-N (2010) Satellite tracking of south-bound female humpback whales in the Kimberley region of Western Australia. Final report to the Australian Marine Mammal Centre, Tasmania, September 2010

Double MC, Jenner KCS, Jenner M-N, Ball I, Laverick S, Gales N (2012a) Satellite tracking of northbound humpback whales (*Megaptera novaeangliae*) off Western Australia. Final report to the Australian Marine Mammal Centre, Tasmania May 2012.

Double MC, Jenner KCS, Jenner M-N, Ball I, Laverick S, Gales N (2012b) Satellite tracking of pygmy blue whales (*Balaenoptera musculus brevicauda*) off Western Australia. Final report to the Australian Marine Mammal Centre, Tasmania, May 2012

DSEWPaC (Department of Sustainability, Environment, Water, Population and Communities) (2012) Conservation Management Plan for the Southern Right Whale. [Online] Department of Sustainability, Environment, Water, Population and Communities Canberra, Commonwealth of Australia Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans

DSEWPaC (2013c) Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*). [Online] Department of Sustainability, Environment, Water, Population and Communities Canberra, Commonwealth of Australia Available from: http://www.environment.gov.au/system/files/resources/1eb9233c-8474-40bb-8566-0ea02bbaa5b3/files/neophoca-cinerea-recovery-plan.pdf

Gales N, Double MC, Robinson S, Jenner C, Jenner M, King E, Gedamke J, Childerhouse S & Paton D (2010) Satellite tracking of Australian humpback (*Megaptera novaeangliae*) and pygmy blue whales (*Balaenoptera musculus brevicauda).* Report number SC/62/SH21 presented to the Scientific Committee of the International Whaling Commission, June 2010, Morocco

Gedamke J, Gales N, Hildebrand J & Wiggins S (2007) Seasonal occurrence of low frequency whale vocalisations across eastern Antarctic and southern Australian waters, February 2004 to February 2007. IWC SC/59/SH5

Gill, P.C., G.J.B. Ross, W.H. Dawbin & H. Wapstra (2000). Confirmed sightings of dusky dolphins *(Lagenorhynchus obscurus)* in southern Australian waters. *Marine Mammal Science*. 16:452-459

Gill PC (2002) A blue whale (*Balaenoptera musculus*) feeding ground in a southern Australian coastal upwelling zone. J. Cetacean Res. Manage. 4(2):179—184

Hale, P.T., Barreto, A.S., Ross, G.J.B. (2000) Comparative morphology and distribution of the *aduncus* and *truncatus* forms of bottlenose dolphin Tursiops in the Indian and Western Pacific Oceans. Aquatic Mammals 26, 101–110.

Hamer, DJ, Ward, TM, Shaughnessy, PD & Clark, SR 2001 Assessing the effectiveness of the Great Australian Bight Marine Park in protecting the endangered Australian sea lion *Neophoca cinerea* from bycatch mortality in shark gillnets. End. Species Res. 14: 203—216

Hedley, SL, Bannister, JL & Dunlop, RA 2011 Abundance estimates of Southern Hemisphere Breeding Stock 'D' Humpback Whales from aerial and land-based surveys off Shark Bay, Western Australia, 2008. J. Cetacean Res. Manage. (special issue 3): 209—221

INPEX Browse. 2010. Icthys Gas Field Development Project: draft environmental impact statement. INPEX Browse, Perth.

Irvine, L. and Kent, C.S. (2018) The distribution and relative abundance of marine mega-fauna, with a focus on humpback whales (Megaptera novaeangliae), in Exmouth Gulf, Western Australia

Irvine, L.G., Thums, M., Hanson, C.E., McMahon, C.R. & Hindell, M.A. (2018) Evidence for a widely expanded humpback whale calving range along the West Australian coast. Marine Mammal Science, 34(2): 294-310.

JASCO Applied Sciences, 2016. Underwater Acoustics: Boise and the Effects on Marine Mammals. Compiled by Christine Erbe, Perth, Western Australia.

Jenner, KCS, Jenner, M-N & McCabe, KA, 2001 Geographical and temporal movements of humpback whales in Western Australian waters. APPEA Journal Vol 41(2001), pp 749—765

Kato, H. (2002). Bryde's Whales *Balaenoptera edeni* and *B. brydei*. **In:** Perrin W.F., B. Wrsig & H.G.M. Thewissen, eds. *Encyclopedia of Marine Mammals*. Page(s) 171-177. Academic Press.

Kemper, C.A. (2002). Distribution of the pygmy right whale, *Caperea marginata*, in the Australasian region. *Marine Mammal Science*. 18(1):99-111.

Leaper, R, Bannister, J. L., Branch, T. A., Clapham, P. J., Donovan, G. P., Matsuoka, K., Reilly, S., and Zerbini, A. N. (2008). A review of abundance, trends and foraging parameters of baleen whales in the Southern Hemisphere, CCAMLR-IWC-WS-08/04 presented to IWC/CCAMLR workshop, Hobart, 2008.

Marsh, H, Eros, C, Penrose, H & Hugues, J 2002, Dugong - Status Report and Action Plans for countries and territories, UNEP Early Warning and Assessment Report Series 1.

McCauley RD (2011) Woodside Kimberley sea noise logger program, Sept-2006 to June-2009: Whales, fish and man-made noise. Report prepared for Woodside Energy Ltd., Perth, Western Australia.

McCauley RD & Jenner C (2010) Migratory patterns and estimated population size of pygmy blue whales (*Balaenoptera musculus brevicauda*) traversing the Western Australian coast based on passive acoustics. SC/62/SH26 in Proceedings of the 62nd IWC Annual Meeting, Agadir, Morocco (June 21–25). Available as SC-62-SH26.pdf in archive at https://iwc.int/document_1453 (Accessed February 2020).

McPherson, C, Kowarski, K, Delarue, Whitt, C, MacDonnell, Martin, B. (2015). Passive Acoustic Monitoring of Ambient Noise and Marine Mammals – Barossa Field: Juley 2014 to July 2015 (No. JASCO Document 00997, Version 1.0). Technical report by JASCO Applied Sciences (Australia) Pty Ltd. For Jacobs.

Möller, L.M. et al. (2020) Movements and behaviour of blue whales satellite tagged in an Australian upwelling system, *Scientific Reports*, 10(1): 21165f

Perrin, W.F. & R.L. Brownell, Jr (2002). Minke Whales *Balaenoptera acutorostrata* and *B. bonaerensis*. **In:** Perrin W.F., Würsig B. & H.G.M. Thewissen, eds. *Encyclopedia of Marine Mammals*. Page(s) 750-754. Academic Press.

Rennie, S, Hanson, C.E, McCauley, R.D, Pattiaratchi, C, Burton, C, Bannister, J, Jenner, C, Jenner, M.N, (2009). Physical properties and processes in the Perth Canyon, Western Australia: links to water column production and seasonal pygmy blue whale abundance. In: J. Mar. Syst., 77, pp. 21–44.

RPS 2010a. Technical Appendix – Marine Mammals. Wheatstone Project EIS/ERMP. Unpublished report for Chevron Australia Pty Ltd, March 2010

RPS. 2010b. Marine Megafauna Report Browse MMFS 2009. Prepared for Woodside Energy Ltd.

Salgado Kent, C, Jenner, C, Jenner, M, Bouchet, P & Rexstad, E. 2012 Southern Hemisphere Breeding Stock D humpback whale population estimates from North West Cape, Western Australia. J. Cetacean Res. Manage. 12(1): 29—38

Thums, M, Ferreira, L.C, Jenner, C, Jenner, M, Harris, D, Davenport, A, Andrews-Goff, V, Double, M, Moller, L, Attard, C.R.M, Bilgmann, K, Thomson, P.G, McCauley, R. (2022) Pygmy blue whale movement, distribution and important areas in the Eastern Indian Ocean. Global Ecology and Conservation 35, e02054.

Whiting, A.U., Thomson, A., Chaloupka, M., Limpus, C. J., 2009. Seasonality, abundance and breeding biology of one of the largest populations of nesting flatback turtles, *Nataor depressus*: Cape Domett, Western Australia. Australian Journal of Zoology 56, 297-303.

Woodside (2012) Rosebud 3D Marine Seismic Survey Environment Plan Summary. Available online at: https://docs.nopsema.gov.au/A251121

Woodside Energy (2014) Browse FLNG Development Draft Environmental Impact Statement, EPBC Referral 2013/7079, November 2014.

Woodside 2020. WA-49-L Gemtree Anchor Hold Testing. NOPSEMA Reference 5049. Accessed at https://info.nopsema.gov.au/activities/406/show_public.

Bannister, J.L., C.M. Kemper & R.M. Warneke (1996). *The Action Plan for Australian Cetaceans*. Canberra: Australian Nature Conservation Agency. Available from: http://www.environment.gov.au/resource/action-plan-australian-cetaceans.

Bejder M, Johnston D.W., Smith J, Friedlaender A, Bejder L (2016) Embracing conservation success of recovering humpback whale populations: Evaluating the case for downlisting their conservation status in Australia. Marine Policy 66 (2016) 137–141.

Branch TA, Stafford KM, Palacios DM, Allison C, Bannister JL, Burton CLK, Cabrera E, Carlson CA, Galletti vernazzani B, Gill PC, Hucke-gaete R, Jenner KC, Jenner M-N, Matsuoka K, Mikhalev YA, Miyashita MG, Morrice S, Nishiwaki VJ, Sturrock D, Tormosov RC, Anderson AN, Baker PB, Best P, Borsa T, Brownell Jr. RL, Childerhouse SK, Findlay P, Gerrodette, T, Ilangakoon, AD, Joergensen, M, Kahn, B, Ljungblad, DK, Maughan, B, Mccauley, RD, Mckay, S, Norris, TF, Oman whale and Dolphin research group, Rankin, S, Samaran, F, Thiele, D, Van Waerebeek K & Warneke RM (2007) Past and present distribution, densities and movements of blue whales *Balaenoptera musculus* in the Southern Hemisphere and Northern Indian Ocean. Mammal Rev. 37(2):116–175

Campbell R (2005) Historical distribution and abundance of the Australian sea lion (*Neophoca cinerea*) on the west coast of Western Australia. Fisheries Research Report no. 148. Department of Fisheries, Perth, Western Australia

Cerchio, S. et al. (2020). A new blue whale song-type described for the Arabian sea and western Indian Ocean. Endanger. Species Res. 43, 495–515

ConocoPhillips 2018. Barossa Area Development Offshore Project Proposal. ConocoPhillips, Perth, Western Australia

DAWE (2020) National Conservation Values Atlas [Online] Department of Environment and Energy Canberra, Commonwealth of Australia Available from: http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf

DAWE (2021) *Xeromys myoides* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat. Accessed Fri, 18 Jun 2021.

Department of Agriculture, Water and the Environment (DAWE) (2020a) Species Profile and Threats Database [Online]. Department of Agriculture, Water and the Environment. Canberra, Commonwealth of Australia. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Department of Agriculture, Water and the Environment (DAWE) (2020b) National Conservation Values Atlas [Online]. Department of Agriculture, Water and the Environment. Canberra, Commonwealth of Australia. Available from: http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf

Department of State Development (DSD) 2010. Browse Liquified Natural Gas Precinct – Strategic Assessment Report. Part 3 – Environmental Assessment - Marine Impacts. December 2010

Department of the Environment (DoE) (2015) Conservation Management Plan for the Blue Whale. A Recovery Plan under the *Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment. Canberra.

DEWHA (Department of the Environment, Water, Heritage and the Arts) (2010a) Blue, Fin and Sei Whale Recovery Plan 2005 - 2010. [Online] Department of the Environment and Heritage Canberra, Commonwealth of Australia Available from: https://www.environment.gov.au/system/files/resources/7dc702c7-80c8-4df5-84b6-cfcbc1da5561/files/cetaceans-assessment.pdf

DEWHA (Department of the Environment, Water, Heritage and the Arts) (2008) The South-West Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems, Conservation Values and Uses of the South-West Marine Region. [Online] Canberra: DEWHA Available from: https://parksaustralia.gov.au/marine/pub/scientific-publications/archive/south-west-marine-bioregional-plan.pdf

DEWR (Department of Environment and Water Resources) (2007) Whales and dolphins identification guide. Department of Environment and Water Resources, Canberra. http://www.environment.gov.au/system/files/resources/9c058c02-afd1-4e5d-abff-11cac2ebc486/files/blue-whale-conservation-management-plan.pdf.

DoEE (2016a). *Sousa sahulensis*— Indo-Pacific Humpback Dolphin. Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=50 [Accessed on 3 August 2016]

DoEE (2016b). *Tursiops aduncus* — Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin. Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=68418 [Accessed on 3 August 2016]

DoEE (2016c) *Orcaella heinsohni* — Australian Snubfin Dolphin. Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=81322 [Accessed on 3 August 2016]

Double MC, Andrews-Goff V, Jenner KCS, Jenner M-N, Laverick SM, Branch TA & Gales N (2014) Migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia as revealed by satellite telemetry. PLOS one, April 2014 9(4)

Double MC, Gales N, Jenner KCS & Jenner M-N (2010) Satellite tracking of south-bound female humpback whales in the Kimberley region of Western Australia. Final report to the Australian Marine Mammal Centre, Tasmania, September 2010

Double MC, Jenner KCS, Jenner M-N, Ball I, Laverick S, Gales N (2012a) Satellite tracking of northbound humpback whales (*Megaptera novaeangliae*) off Western Australia. Final report to the Australian Marine Mammal Centre, Tasmania May 2012.

Double MC, Jenner KCS, Jenner M-N, Ball I, Laverick S, Gales N (2012b) Satellite tracking of pygmy blue whales (*Balaenoptera musculus brevicauda*) off Western Australia. Final report to the Australian Marine Mammal Centre, Tasmania, May 2012

Double, M.C. et al. (2014) Migratory Movements of Pygmy Blue Whales (Balaenoptera musculus brevicauda) between Australia and Indonesia as Revealed by Satellite Telemetry, PLOS one, 9(4)

DSEWPaC (2013c) Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*). [Online] Department of Sustainability, Environment, Water, Population and Communities Canberra, Commonwealth of Australia Available from: http://www.environment.gov.au/system/files/resources/1eb9233c-8474-40bb-8566-0ea02bbaa5b3/files/neophoca-cinerea-recovery-plan.pdf

DSEWPaC (Department of Sustainability, Environment, Water, Population and Communities) (2012) Conservation Management Plan for the Southern Right Whale. [Online] Department of Sustainability, Environment, Water, Population and Communities Canberra, Commonwealth of Australia Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans

Gales N, Double MC, Robinson S, Jenner C, Jenner M, King E, Gedamke J, Childerhouse S & Paton D (2010) Satellite tracking of Australian humpback (*Megaptera novaeangliae*) and pygmy blue whales (*Balaenoptera musculus brevicauda).* Report number SC/62/SH21 presented to the Scientific Committee of the International Whaling Commission, June 2010, Morocco

Gedamke J, Gales N, Hildebrand J & Wiggins S (2007) Seasonal occurrence of low frequency whale vocalisations across eastern Antarctic and southern Australian waters, February 2004 to February 2007. IWC SC/59/SH5

Gill PC (2002) A blue whale (*Balaenoptera musculus*) feeding ground in a southern Australian coastal upwelling zone. J. Cetacean Res. Manage. 4(2):179—184

Gill, P.C., G.J.B. Ross, W.H. Dawbin & H. Wapstra (2000). Confirmed sightings of dusky dolphins *(Lagenorhynchus obscurus)* in southern Australian waters. *Marine Mammal Science*. 16:452-459

Hale, P.T., Barreto, A.S., Ross, G.J.B. (2000) Comparative morphology and distribution of the *aduncus* and *truncatus* forms of bottlenose dolphin Tursiops in the Indian and Western Pacific Oceans. Aquatic Mammals 26, 101–110.

Hamer, DJ, Ward, TM, Shaughnessy, PD & Clark, SR 2001 Assessing the effectiveness of the Great Australian Bight Marine Park in protecting the endangered Australian sea lion *Neophoca cinerea* from bycatch mortality in shark gillnets. End. Species Res. 14: 203—216

Hedley, SL, Bannister, JL & Dunlop, RA 2011 Abundance estimates of Southern Hemisphere Breeding Stock 'D' Humpback Whales from aerial and land-based surveys off Shark Bay, Western Australia, 2008. J. Cetacean Res. Manage. (special issue 3): 209—221

INPEX Browse. 2010. Icthys Gas Field Development Project: draft environmental impact statement. INPEX Browse, Perth.

Irvine, L. and Kent, C.S. (2018) The distribution and relative abundance of marine mega-fauna, with a focus on humpback whales (Megaptera novaeangliae), in Exmouth Gulf, Western Australia

Irvine, L.G., Thums, M., Hanson, C.E., McMahon, C.R. & Hindell, M.A. (2018) Evidence for a widely expanded humpback whale calving range along the West Australian coast. Marine Mammal Science, 34(2): 294-310.

JASCO Applied Sciences, 2016. Underwater Acoustics: Boise and the Effects on Marine Mammals. Compiled by Christine Erbe, Perth, Western Australia.

Jenner, KCS, Jenner, M-N & McCabe, KA, 2001 Geographical and temporal movements of humpback whales in Western Australian waters. APPEA Journal Vol 41(2001), pp 749—765

Kato, H. (2002). Bryde's Whales *Balaenoptera edeni* and *B. brydei*. **In:** Perrin W.F., B. Wrsig & H.G.M. Thewissen, eds. *Encyclopedia of Marine Mammals*. Page(s) 171-177. Academic Press.

Kemper, C.A. (2002). Distribution of the pygmy right whale, *Caperea marginata*, in the Australasian region. *Marine Mammal Science*. 18(1):99-111.

Leaper, R, Bannister, J. L., Branch, T. A., Clapham, P. J., Donovan, G. P., Matsuoka, K., Reilly, S., and Zerbini, A. N. (2008). A review of abundance, trends and foraging parameters of baleen whales in the Southern Hemisphere, CCAMLR-IWC-WS-08/04 presented to IWC/CCAMLR workshop, Hobart, 2008.

Marsh, H, Eros, C, Penrose, H & Hugues, J 2002, Dugong - Status Report and Action Plans for countries and territories, UNEP Early Warning and Assessment Report Series 1.

McCauley RD & Jenner C (2010) Migratory patterns and estimated population size of pygmy blue whales (*Balaenoptera musculus brevicauda*) traversing the Western Australian coast based on passive acoustics. SC/62/SH26 in Proceedings of the 62nd IWC Annual Meeting, Agadir, Morocco (June 21–25). Available as SC-62-SH26.pdf in archive at https://iwc.int/document_1453 (Accessed February 2020).

McCauley RD (2011) Woodside Kimberley sea noise logger program, Sept-2006 to June-2009: Whales, fish and man-made noise. Report prepared for Woodside Energy Ltd., Perth, Western Australia.

McPherson, C, Kowarski, K, Delarue, Whitt, C, MacDonnell, Martin, B. (2015). Passive Acoustic Monitoring of Ambient Noise and Marine Mammals – Barossa Field: Juley 2014 to July 2015 (No. JASCO Document 00997, Version 1.0). Technical report by JASCO Applied Sciences (Australia) Pty Ltd. For Jacobs.

Möller, L.M. et al. (2020) Movements and behaviour of blue whales satellite tagged in an Australian upwelling system, *Scientific Reports*, 10(1): 21165f

Perrin, W.F. & R.L. Brownell, Jr (2002). Minke Whales *Balaenoptera acutorostrata* and *B. bonaerensis*. **In:** Perrin W.F., Würsig B. & H.G.M. Thewissen, eds. *Encyclopedia of Marine Mammals*. Page(s) 750-754. Academic Press.

Rennie, S, Hanson, C.E, McCauley, R.D, Pattiaratchi, C, Burton, C, Bannister, J, Jenner, C, Jenner, M.N, (2009). Physical properties and processes in the Perth Canyon, Western Australia: links to water column production and seasonal pygmy blue whale abundance. In: J. Mar. Syst., 77, pp. 21–44.

RPS 2010a. Technical Appendix – Marine Mammals. Wheatstone Project EIS/ERMP. Unpublished report for Chevron Australia Pty Ltd, March 2010

RPS. 2010b. Marine Megafauna Report Browse MMFS 2009. Prepared for Woodside Energy Ltd.

Salgado Kent, C, Jenner, C, Jenner, M, Bouchet, P & Rexstad, E. 2012 Southern Hemisphere Breeding Stock D humpback whale population estimates from North West Cape, Western Australia. J. Cetacean Res. Manage. 12(1): 29—38

Thums, M, Ferreira, L.C, Jenner, C, Jenner, M, Harris, D, Davenport, A, Andrews-Goff, V, Double, M, Moller, L, Attard, C.R.M, Bilgmann, K, Thomson, P.G, McCauley, R. (2022) Pygmy blue whale movement, distribution and important areas in the Eastern Indian Ocean. Global Ecology and Conservation 35, e02054.

Whiting, A.U., Thomson, A., Chaloupka, M., Limpus, C. J., 2009. Seasonality, abundance and breeding biology of one of the largest populations of nesting flatback turtles, *Nataor depressus*: Cape Domett, Western Australia. Australian Journal of Zoology 56, 297-303.

Woodside (2012) Rosebud 3D Marine Seismic Survey Environment Plan Summary. Available online at: https://docs.nopsema.gov.au/A251121

Woodside 2020. WA-49-L Gemtree Anchor Hold Testing. NOPSEMA Reference 5049. Accessed at https://info.nopsema.gov.au/activities/406/show_public.

Woodside Energy (2014) Browse FLNG Development Draft Environmental Impact Statement, EPBC Referral 2013/7079, November 2014.

## 15.8. Birds

Astron (2017a), Quadrant Environmental Monitoring Program Varanus and Airlie Islands Shearwater Monitoring Annual Report 2016/17, Prepared for Quadrant Energy Australia Ltd by Astron Environmental Services, Perth, Western Australia, June 2017. Report reference EA-60-RI-10174

Astron (2017b), Quadrant Environmental Monitoring Program Varanus and Airlie Islands Seabird Monitoring Annual Report 2016/17, Prepared for Quadrant Energy Australia Ltd by Astron Environmental Services, Perth, Western Australia, September 2017. Report reference EA-60-RI-10184

Bamford M, Watkins D, Bancroft W, Tischler G & Wahl J (2008) Migratory Shorebirds of the East Asian - Australasian Flyway; Population Estimates and Internationally Important Sites. Wetlands International – Oceania, Canberra, Australia

Barrett, G., A. Silcocks, S. Barry, R. Cunningham & R. Poulter (2003). The New Atlas of Australian Birds. Melbourne, Victoria: Birds Australia.

Bennelongia (2008) Report on shorebird numbers and shorebird values at Cape Preston. Prepared for Citic Pacific Mining by Bennelongia Environmental Consultants, Report 2008/52

Bennelongia (2011) Port Hedland Migratory shorebird survey report and impact assessment. Prepared for BHP Billiton Iron Ore by Bennelongia Environmental Consultants, Report 2011/124

Blakers, M., S.J.J.F. Davies & P.N. Reilly (1984). The Atlas of Australian Birds. Melbourne, Victoria: Melbourne University Press.

Brooke, M. (2004). Albatrosses and Petrels Across The World. Oxford University Press, Oxford, UK.

Burbidge AA, Blyth JD, Fuller PJ, Kendrick PG, Stanley FJ & Smith LA (2000) The Terrestrial Vertebrate Fauna of the Montebello Islands, Western Australia. CALMScience 3: 95-107

CALM & MPRA (2005a) Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005–2015. Management Plan No. 52. Department of Conservation and Land Management and Marine Parks and Reserves Authority. Perth, WA

CALM & MPRA (2005b) Indicative Management Plan for the Proposed Dampier Archipelago Marine Park and Cape Preston Marine Management Area. Department of Conservation and Land Management and Marine Parks and Reserves Authority. Perth, WA

Chatto, R. (2001). The distribution and status of colonial breeding seabirds in the Northern Territory. Parks & Wildlife Commission of the NT Technical Report. 70pp.

Chevron (2010) A Guide to the Birds of Barrow Island. Available from: https://australia.chevron.com/-/media/australia/publications/documents/nature-book-birds.pdf

Commonwealth of Australia (2017b) EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species. Commonwealth of Australia.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2020). Conservation Advice for Falco hypoleucos (Grey Falcon). DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023). Conservation Advice for Phaethon rubricauda westralis (Indian Ocean red-tailed tropicbird) DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024a). Species Profile and Threats Database: Limnodromus semipalmatus — Asian Dowitcher. DCCEEW, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024b). Species Profile and Threats Database: Calidris acuminata — Sharp-tailed Sandpiper. DCCEEW, Canberra.

DEWHA (Department of the Environment, Water, Heritage and the Arts) (2008a) The North-West Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems, Conservation Values and Uses of the South-West Marine Region. [Online]. Canberra: DEWHA. Available from: https://parksaustralia.gov.au/marine/pub/scientific-publications/archive/north-west-bioregional-plan.pdf

Dinara Pty Ltd. (1991) Report on results of shearwater monitoring on Varanus Island, Western Australia for the inclusion in the Hadson Energy Triennial report 1991.

DoE (2014e) *Macronectes halli* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1061. Accessed 23 July 2014

DoE (2014g) *Papasula abbotti* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59297. Accessed 23 July 2014

DoE (2014h) *Rostratula australis* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=77037. Accessed 23 July 2014

Department of Agriculture, Water and the Environment (DAWE) (2020a) Species Profile and Threats Database [Online]. Department of Agriculture, Water and the Environment. Canberra, Commonwealth of Australia. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Department of Agriculture, Water and the Environment (DAWE) (2020b) National Conservation Values Atlas [Online]. Department of Agriculture, Water and the Environment. Canberra, Commonwealth of Australia. Available from: http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf

DoF 2012. Exploring the Houtman Abrolhos Islands. Published by Department of Fisheries, Perth, Western Australia. Publication No. 105, June 2012.

DSEWPaC (Department of Sustainability, Environment, Water, Population and Communities) (2012a) Species group report card- seabirds. Supporting the marine bioregional plan for the North-west Marine Region. Commonwealth of Australia, 2012

DSEWPaC (2012b) Species group report card- seabirds. Supporting the marine bioregional plan for the South-west Marine Region. Commonwealth of Australia, 2012

DSEWPaC (2011) National recovery plan for threatened albatrosses and giant petrels 2011-2016. Commonwealth of Australia, Hobart

The East Asian-Australasian Flyway Partnership [EAAFP], 2018. Home - Eaaflyway. [Accessed 8 April 2024]

Egevang, C., Stenhouse I.J., Phillips R.A., Petersen A., Fox, J.W and Silk, J.R.D. (2010) Tracking of Arctic Terns Sterna paradisaea reveals longest animal migration. Proceedings of the National Academy of Sciences of the United States of America 107: 2078 – 2081

Garnet ST, Szabo JK, Dutson G (2011) The Action Plan for Australian Birds 2010. CSIRO Publishing, Melbourne

Hansen, B.D., Fuller, R.A., Watkins, D., Rogers, D.I., Clemens, R.S., Newman, M., Woehler, E.J. and Weller, D.R. (2016) Revision of the East Asian-Australasian Flyway Population Estimates for 37 listed Migratory Shorebird Species. Unpublished report for the Department of the Environment. BirdLife Australia, Melbourne.

Higgins PJ & Davies SJJF eds (1996) Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons. Melbourne, Victoria: Oxford University Press

Hill R, Bamford M, Rounsevell D & Vincent J (1988) Little Terns and Fairy Terns in Australia - an RAOU Conservation Statement. RAOU Report Series. 53:1-12

Lane, B.A. (1987). Shorebirds in Australia. Sydney, NSW: Reed.

Lindsey TR (1986) The Seabirds of Australia. North Ryde, NSW: Angus and Robertson

Marchant S & Higgins PJ eds. (1990) Handbook of Australian, New Zealand and Antarctic Birds. Volume One - Ratites to Ducks. Melbourne, Victoria: Oxford University Press

Marchant S & Higgins PJ (Eds) (1993) Handbook of Australian, New Zealand and Antarctic Birds. Volume Two - Raptors to Lapwings. Oxford University Press, Melbourne

May RF, Lenanton RCJ & Berry PF (1983) Ningaloo Marine Park. Report and recommendations by the Marine Parks and Reserves Selection Working Group. National Parks Authority, Perth, Western Australia

Minton, C.D.T. (2002). Personal communication. Australasian Wader Studies Group.

Moore, J.L. (1985). Norfolk Island notes. Notornis. 32:311-318

Oro, D., Cam, E., Pradel, R. and Martinetz-Abrain, A. (2004). Influence of food availability on demography and local population dynamics in a long-lived seabird. Proceedings of the Royal Society B. 271 (1537): 387–396

Rogers, D. 1999. What determines shorebird feeding distribution in Roebuck Bay? Chapter 9, 145-174. In Pepping, M., Piersma, T., Pearson, G. and Lavaleye, M. (eds) 1999. Intertidal sediments and benthic animals of Roebuck Bay, Western Australia. Netherlands Institute for Sea Research Report 3, Texel, Netherlands, 1-214

Stokes, T. 1988. A review of the birds of Christmas Island, Indian Ocean. Australian National Parks & Wildlife Service Occasional Paper 16.

Stokes T & Hinchey M (1990) Which small Noddies breed at Ashmore Reef in Eastern Indian Ocean? Emu. 90:269-271

Storr GM, Johnstone RE & Griffin P (1986). Birds of the Houtman Abrolhos, Western Australia. Records of the Western Australian Museum Supplement. 24

Surman CA (2003) Second Field Survey of the Avifauna of the Barrow Island-Double Island Area, December 2003. Prepared for Apache Energy Ltd

Surman CA (2013) Scientific monitoring program 07 seabirds and shorebirds. Unpublished report to Apache Energy Ltd

Surman CA & Nicholson LW (2006) ‘Seabirds,’ in S McClatchie, J Middleton, C Pattiaratchi, D Currie & G Kendrick (eds), The South-west Marine Region: ecosystems and key species groups, Australian Government Department of the Environment and Water Resources, Hobart

Surman CA & Nicholson LW (2012) Monitoring of annual variation in seabird breeding colonies throughout the Lowendal Group of islands: 2012 Annual Report. Unpublished report prepared for Apache Energy Ltd. by Halfmoon Biosciences. 42pp.

Surman CA & Nicholson LW (2013) Monitoring of annual variation in seabird breeding colonies throughout the Lowendal Group of islands: 2013 Annual Report. Lowendal Island Seabird Monitoring Program (LISMP). Unpublished report prepared for Apache Energy Ltd. by Halfmoon Biosciences. 59pp.

Threatened Species Scientific Committee (TSSC) (2020a). Conservation Advice for the Christmas Island Frigatebird *Fregeta andrewsii.* Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1011-conservation-advice-19102020.pdf. In effect under the EPBC Act from 19-Oct-2020.

Threatened Species Scientific Committee (TSSC) (2020b). Conservation Advice the Abbott's booby *Papasula abbotti*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/59297-conservation-advice-19102020.pdf. In effect under the EPBC Act from 19-Oct-2020.

Watkins, D. (1993). A national plan for shorebird conservation in Australia. RAOU Report Series. 90.

## 15.9. Protected Areas

Amaral A.L. (2010) Information Share Among Participants on MPA and MPAs Network Development in the 6th ICRISE Regional Workshop. National Directorate of Fisheries and Aquaculture. Timor-Leste

Asia Development Bank (ADB) 2014. State of the Coral Triangle: Indonesia. Mandaluyong City, Philippines 2014.

Bennelongia Pty Ltd (2009) Ecological Character Description for Roebuck Bay. Report prepared for the Department of Environment and Conservation, Perth, Western Australia. Available at <https://www.dpaw.wa.gov.au/images/documents/conservation-management/wetlands/ramsar/roebuck-bay-ecd_final-with-disclaimer.pdf> [Accessed April 2014]

BMT WBM (2010) Ecological Character Description for Kakadu National Park Ramsar Site. Prepared for the Australian Government Department of Sustainability, Environment, Water, Population and Communities. Available online: https://www.environment.gov.au/system/files/resources/72c10ebd-7eeb-4841-89ab-a5004052f2ae/files/2-ecd.pdf [Accessed June 2021].

BMT WBM (2011) Ecological Character Description for Cobourg Peninsula Ramsar Site. Prepared for the Australian Government, Canberra. https://www.environment.gov.au/system/files/resources/21746527-9ee4-44eb-a2a6-aa08463d985b/files/1-ecd_0.pdf [Accessed June 2021].

CALM (WA Department of Conservation and Land Management) (1998b). Leschenault Peninsula Management Plan. Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/leschenault.pdf. [Accessed Jan 2019]

CALM (WA Department of Conservation and Land Management) (2002). Shoalwater Islands Management Plan. Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/shoalwater_islands.pdf. [Accessed Jan 2019]

CALM (WA Department of Conservation and Land Management) (2004). Turquoise Coast Nature Reserve Management Plan. Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/turquoise_coast_final.pdf [Accessed Jan 2019]

Commonwealth of Australia, 2002. Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve Management Plans. Environment Australia.

DAWE 2020b. Australian Wetlands Database, Important Wetlands, Hutt Lagoon System. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA035 [Accessed 19 March 2020].

DAWE 2020c. Australian Wetlands Database, Important Wetlands, Lake Macleod. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA009 [Accessed 19 March 2020].

DAWE 2020d. Australian Wetlands Database, Important Wetlands, Lake Thetis. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA084 [Accessed 19 March 2020].

DAWE 2020e. Australian Wetlands Database, Important Wetlands, Learmonth Air Weapons Range – Saline Coastal Flats. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA084 [Accessed 19 March 2020].

DAWE 2020g Australian Wetlands Database, Important Wetlands, Prince Regent River System. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA064 [Accessed 19 March 2020].

DAWE 2020h. Australian Wetlands Database, Important Wetlands, Rottnest Island Lakes. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA089 [Accessed 19 March 2020].

DAWE 2020i. Australian Wetlands Database, Important Wetlands, Shark Bay East. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA011 [Accessed 19 March 2020].

DAWE 2020j. Australian Wetlands Database, Important Wetlands, Cape Leeuwin System. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA103 [Accessed 19 March 2020].

DAWE 2020k. Australian Wetlands Database, Important Wetlands, Doggerup Creek System. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA104 [Accessed 19 March 2020].

DCCEEW 2024. Australian Heritage Database. Home Island Foreshore, Jalan Panti, Home Island Settlement, EXT, Australia. Australian Heritage Database (environment.gov.au) [Accessed 17 January 2024]

DEC (WA Department of Environment and Conservation) (2010b). Woodman Park Regional Park Management Plan. Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/woodman_pt_mgmt_plan_-_draft_9_web_feb_10.pdf. [Accessed Jan 2019]

DEC (WA Department of Environment and Conservation) (2010c). Rockingham Lakes Regional Park Management Plan. Available from: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/rockingham_lakes_regional_park_management_plan__cover.pdf [Accessed July 2021]

DEC (WA Department of Environment and Conservation) (2010d). Rockingham Lakes Regional Park Management Plan. https://www.dbca.wa.gov.au/management/plans/rockingham-lakes-regional-park

DEC (WA Department of Environment and Conservation) (2012b). Shannon and D'Entrecasteaux National Parks Management Plan No. 71. https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/shannon_and_dentrecasteaux_national_parks_management_plan_71_2012.pdf. [Accessed December 2019]

DEC (WA Department of Environment and Conservation) (2012c). Ord River and Parry Lagoons Nature Reserves Management Plan. Available from: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/ord-river-and-parry-lagoons-nature-reserves-management-plan-2012_webversion.pdf [Accessed July 2021].

DEC (WA Department of Environment and Conservation) (2008). Walpole Wilderness and Adjacent Parks and Reserves Management Plan. https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/wwa_mp_070708_nomaps.pdf. [Accessed December 2019]

DEC (WA Department of Environment and Conservation) (2009). Walpole and Nornalup Inlets Marine Park Management Plan No 62. https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/wni_mp2009_2.pdf. [Accessed December 2019]

DEC (WA Department of Environment and Conservation) (2015). Rockingham Lakes Regional Park. Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/rockingham_lakes_regional_park_management_plan__cover.pdf. [Accessed Jan 2019]

DoNP (Director of National Parks) (2002). Christmas Island National Park Management Plan.

DoE (Department of Environment) (2014a) World Heritage Places - The Ningaloo Coast Western Australia. Available at: http://www.environment.gov.au/node/19787 [Accessed April 2014]

DoE (2014b) Shark Bay, Western Australia, Work Heritage Values. Available at: http://www.environment.gov.au/heritage/places/world/shark-bay [Accessed April 2014]

DoE (2014e) Australian Heritage Database. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105967 [Accessed December 2014]

DoE (2014f) Australian Heritage Database. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105578 [Accessed December 2014]

DoE (2014g) Australian Heritage Database. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105551 [Accessed December 2014]

DoE (2014h) Claypans of the Swan Coastal Plain in Community and Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=121 [Accessed December 2014]

DoE (2014i) Aquatic Root Mat Community in Caves of the Swan Coastal Plain in Community Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=12 [Accessed December 2014]

DoE (2014j) Sedgelands in Holocene dune swales of the southern Swan Coastal Plain in Community and Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=19 [Accessed December 2014]

DoE (2014k) Subtropical and Temperate Coastal Saltmarsh in Community and Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=118 [Accessed December 2014]

DoE (2014l) Australian Wetlands Database, Ramsar wetlands, Becher Point. Available at: http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=54 [Accessed December 2014]

DoE (2014m) Australian Wetlands Database, Ramsar wetlands, Peel-Yalgorup System. Available at: http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=36 [Accessed December 2014]

DoE (2014n) Australian Wetlands Database, Ramsar wetlands, Vasse-Wonnerup System. Available at: http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=38 [Accessed December 2014]

DoEE (2019) Australian Wetlands Database, Ramsar wetlands, Hosnies Spring. Available at: http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=40 [Accessed November 2019]

DoEE (2019a) Australian Wetlands Database, Ramsar wetlands The Dales. Available at: http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=61 [Accessed December 2014]

DoEE (Department of Environment and Energy) (2019b). Australian Heritage Database, Dirk Hartog Landing Site 1616 - Cape Inscription Area, Dirk Hartog Island, WA, Australia. Available at http: http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105808 [Accessed November 2019]

DoEE (2019d). Australian Heritage Database, Fitzgerald River National Park, South Coast Hwy, Ravensthorpe, WA, Australia. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105974 [Accessed November 2019]

DoEE (2019e). Australian Heritage Database, Lesueur National Park, Coorow Green Head Rd, Green Head, WA, Australia. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105967 [Accessed November 2019]

DoEE (2019f). Australian Heritage Database, Christmas Island Natural Areas, Settlement, EXT, Australia. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;search=place_name%3DChristmas%2520Island%2520Natural%2520Areas%3Bkeyword_PD%3Don%3Bkeyword_SS%3Don%3Bkeyword_PH%3Don%3Blatitude_1dir%3DS%3Blongitude_1dir%3DE%3Blongitude_2dir%3DE%3Blatitude_2dir%3DS%3Bin_region%3Dpart;place_id=105187 [Accessed November 2019]

DoEE (2019g). Australian Heritage Database, Yampi Defence Area, Koolan Island, WA, Australia. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;search=place_name%3DYampi%2520Defence%2520Area%3Bkeyword_PD%3Don%3Bkeyword_SS%3Don%3Bkeyword_PH%3Don%3Blatitude_1dir%3DS%3Blongitude_1dir%3DE%3Blongitude_2dir%3DE%3Blatitude_2dir%3DS%3Bin_region%3Dpart;place_id=105418 [Accessed November 2019]

DoEE (2019i). Australian Heritage Database, Lancelin Defence Training Area, Mimegarra Rd, Lancelin, WA, Australia. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;search=place_name%3DLancelin%2520Defence%2520Training%2520Area%3Blist_code%3DCHL%3Bkeyword_PD%3Don%3Bkeyword_SS%3Don%3Bkeyword_PH%3Don%3Blatitude_1dir%3DS%3Blongitude_1dir%3DE%3Blongitude_2dir%3DE%3Blatitude_2dir%3DS%3Bin_region%3Dpart;place_id=105578 [Accessed November 2019]

DoE (2015a) Australian Heritage Database. Available at: http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=106003 [Accessed January 2015]

DoE (2015b) Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia in Community and Species Profile and Threats Database, Department of the Environment, Canberra. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=126&status=Endangered [Accessed January 2015]

DoEE (2016a) Yampi Defence Area, Koolan Island, WA, Australia. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105418 [Accessed 2 August 2016]

DoE (2014b) *Pristis clavata* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=68447. [Accessed 18 Mar 2014]

DoEE (2016b) Garden Island, Garden Island, WA, Australia. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105274 [Accessed 2 August 2016]

DPAW (WA Department of Parks and Wildlife) (2015). Kalbarri National Park Management Plan. Available from: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/kallbarri_web_mgt_plan.pdf [Accessed February 2020]

DPAW (WA Department of Parks and Wildlife) (2015). Leeuwin-Naturaliste Capes Area Parks and Reserves Management Plan. Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/Leeuwin-Naturaliste_management_plan_2015_WEB.pdf. [Accessed Jan 2019]

DPAW (WA Department of Parks and Wildlife) (2016). Yawaru Birragun Conservation Park Management Plan. Available at https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/ybcp_mangement_plan_web.pdf [Accessed Jan 2019]

DPAW (WA Department of Parks and Wildlife) (2016b). Albany coast draft management plan 2016. https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/albany_coast_draft_management_plan.pdf [Accessed December 2019]

DPAW (WA Department of Parks and Wildlife) (2016c). Swan Coastal Plain South Management Plan. Available from: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/swan_coastal_plain_south_management_plan.pdf [Accessed July 2021]

Erdmann M.V. & Mohan C. (2013). A Rapid Marine Biological Assessment of Timor-Leste. Timor-Leste's National Coordinating Committee with funding from the United States Agency for International Development's Coral Triangle Support Partnership (CTSP).

Hale, J (2008), Ecological Character Description of the Ord River Floodplain Ramsar Site, Report to the Department of Environment and Conservation, Perth, Western Australia. Available online: https://www.dpaw.wa.gov.au/images/documents/conservation-management/wetlands/ramsar/ord-floodplain-ecd_final-with-disclaimer.pdf [Accessed June 2021].

Hale, J., Butcher, R., 2013. Ashmore Reef Commonwealth Marine Reserve Ramsar Site ecological character description (A report to the Department of the Environment). Department of the Environment, Canberra.

Hale, J., 2010, Ecological Character Description for the Pulu Keeling National Park Ramsar Site. Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Huffard, C & Erdmann, M.V. & Gunawan, T. (2012). Defining geographic priorities for marine biodiversity conservation in Indonesia.

Indahnesia, 2011. Indonesian National Parks. Available online: https://indahnesia.com/indonesia [Accessed June 2021].

Moore L, Knot B and Stanley N (1983) The Stromatolites of Lake Clifton, Western Australia – Living Structures Representing the Origins of Life. Search 14:11-12.

Roebuck Bay Working Group (RBWG) (2010). Preliminary Draft Roebuck Bay Ramsar Site Management Plan. Available from: https://www.roebuckbay.org.au/pdfs/RBRSMP-Preliminary-Draft-021209.pdf [Accessed July 2021]

Savu Sea National Marine Conservation Area, Undated. Coral Triangle Atlas – Savu Sea National Marine Conservation Area information requirements for inclusion in CTMPAs Categories 3 or 4. Available at http://ctatlas.reefbase.org/pdf/monitoring/CTMPAS%20SavuSea%20July%202014.pdf [Accessed August 2016]

UNDP Indonesia (2017). The Magnificent Seven: Indonesia's Marine National Parks. Available online: file:///C:/Users/envir/Downloads/The%20Magnificent%20Seven%20Indonesias%20Marine%20National%20Parks%20(1).pdf [Accessed June 2021].

CALM (Department of Conservation and Land Management) (1990) Dampier Archipelago Nature Reserves Management Plan. https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/dampier_archipelago.pdf [Accessed Jan 2019]

CALM (Department of Conservation and Land Management) (1991). Fitzgerald River National Park Management Plan 1991 – 2001 No. 15. https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/fitzgerald_river.pdf [Accessed December 2019]

CALM (WA Department of Conservation and Land Management) (1998a). Namburg National Park Management Plan. Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/nambung.pdf. [Accessed Jan 2019]

CALM (WA Department of Conservation and Land Management) (2003). Carnac Island Nature Reserve Management Plan (2003). Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/2003240-carnac_plan.pdf. [Accessed Jan 2019]

CALM (WA Department of Conservation and Land Management)(1995). Yalgorup National Park Management Plan.

CALM (WA Department of Conservation and Land Management)(1999). Jarabi and Bundegi Coastal Parks and Muiron Islands Management Plan. Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/jurabi.pdf [Accessed Jan 2019]

DAWE 2020a. Australian Wetlands Database, Important Wetlands, Exmouth Gulf East Wetland. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA007 [Accessed 19 March 2020].

DAWE 2020f. Australian Wetlands Database, Important Wetlands, Leslie (Port Hedland) Saltfields System. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA068 [Accessed 19 March 2020].

DAWE 2020l. Australian Wetlands Database, Important Wetlands, Cape Range Subterranean Waterways. http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=WA006 [Accessed 19 March 2020].

DBCA (WA Department of Biodiversity, Conservation, and Attractions) (2022). Houtman Abrolhos Islands National Park Management Plan 97. https://www.dbca.wa.gov.au/sites/default/files/2023-01/Houtman%20Abrolhos%20Islands%20National%20Park%20management%20plan%2097%202022.pdf

DBCA (WA Department of Biodiversity, Conservation, and Attractions) (2022b). Nyinggulu (Ningaloo) Coastal Reserves Joint Management Plan. https://www.dbca.wa.gov.au/management/plans/nyinggulu-ningaloo-coastal-reserves

DBCA (WA Department of Biodiversity, Conservation, and Attractions) (2020). Guniyan Binba Conservation Park Joint Management Plan 2020. https://www.dbca.wa.gov.au/management/plans/guniyan-binba-conservation-park

DBCA (WA Department of Biodiversity, Conservation, and Attractions) (2019). Pilbara Inshore Islands. Frequently Asked Questions.

DBCA (WA Department of Biodiversity, Conservation, and Attractions) (2019b). Parks and reserves of the south-west Kimberley and north-west Pilbara Joint Management Plan. https://www.dbca.wa.gov.au/media/1339/download

DEC (Department of Environment and Conservation) (2011) Interim Recovery Plan 2011-2016 for Sedgelands in Holocene dune swales, Interim Recovery Plan No. 314

DEC (Department of Environment and Conservation) (2012a) World Heritage Areas. Available at https://www.environment.gov.au/heritage/about/world-heritage [Accessed June 2013]

DEC (Department of Environment and Conservation) 2002. A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions.

DEC (WA Department of Environment and Conservation) & MPRA (Marine Parks and Reserves Authority) (2007). Shoalwater Islands Marine Park Management Plan. https://www.dbca.wa.gov.au/management/plans/shoalwater-islands-marine-park

DEC (WA Department of Environment and Conservation) (2010a). Cape Range National Park Management Plan

DEC (WA Department of Environment and Conservation) (2013). Murujuga National Park management plan

DEWHA (2008) Shark Bay World Heritage Property Strategic Plan 2008-2020. Department of the Environment, Water, Heritage and the Arts, Canberra, Australia

DEWHA (2010b) Ningaloo Coast World Heritage Nomination. Department of the Environment, Water, Heritage and the Arts, Canberra, Australia. Available at < http://www.environment.gov.au/node/19787> [Accessed April 2014]

DNP (Director of National Parks) (2016). Kakadu National Park Management Plan 2016-2026. Available from: https://www.environment.gov.au/system/files/resources/1f88c5a3-409c-4ed9-9129-ea0aaddd4f33/files/kakadu-management-plan-2016-2026.pdf [Accessed July 2021]

DNREAS (Department of Natural Resources, Environment, The Arts and Sport) (2011). Cobourg Marine Park Plan of Management. Available from: https://dtc.nt.gov.au/__data/assets/pdf_file/0006/249045/Cobourg-Marine-Park.pdf [Accessed July 2021]

DoE (2014c) Australian Ramsar Wetlands Database: Roebuck Bay. Available at http://www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=33 [Accessed July 2013]

DoE (2014d) Australian Heritage Database. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl [Accessed April 2014]

DoEE (2019c). Australian Heritage Database, Dampier Archipelago (including Burrup Peninsula), Karratha Dampier Rd, Dampier, WA, Australia. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105727 [Accessed November 2019]

DoEE (2019h). Australian Heritage Database, Learmonth Air Weapons Range Facility, Learmonth, WA, Australia. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;search=place_name%3DLearmonth%2520Air%2520Weapons%2520Range%2520Facility%3Bkeyword_PD%3Don%3Bkeyword_SS%3Don%3Bkeyword_PH%3Don%3Blatitude_1dir%3DS%3Blongitude_1dir%3DE%3Blongitude_2dir%3DE%3Blatitude_2dir%3DS%3Bin_region%3Dpart;place_id=105551 [Accessed November 2019]

DoE (Department of Environment) 2012. Interim Biogeographic Regionalisation for Australia, Version 7. Available at: http://www.environment.gov.au/system/files/pages/5b3d2d31-2355-4b60-820c-e370572b2520/files/bioregions-new.pdf [Accessed January 2019]

DPAW (WA Department of Parks and Wildlife) (2012). Shark Bay Terrestrial Reserves and Proposed Reserve Additions Management Plan. Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/sharkbay_managementplanno75_2012.pdf [Accessed Jan 2019]

DPAW (WA Department of Parks and Wildlife) (2014). Eighty Mile Beach Marine Park Management Plan 2014-2024. Available from: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/eighty-mile-beach-management-plan.pdf [Accessed July 2021]

DPAW (WA Department of Parks and Wildlife) (2015). Barrow Island Group Nature Reserves Management Plan. https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/barrow_group_nature_reserves_management_plan_finalweb.pdf [Accessed Jan 2012]

DPAW (WA Department of Parks and Wildlife) (2016). Parks and reserves of the south-west Kimberley and north-west Pilbara Draft Management Plan (2016). Available at: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/20160400_swest_kimberley_draft_mp_v7.pdf

Hale J & Butcher R (2009) Ecological Character Description of the Eighty Mile Beach Ramsar Site. Report to the Department of Environment and Conservation, Perth, Western Australia. Available at https://www.dpaw.wa.gov.au/images/documents/conservation-management/wetlands/ramsar/eighty-mile-beach-ecd_final-with-disclaimer.pdf [Accessed April 2014]

UNESCO (2020) Shark Bay, Western Australia. Available at: https://whc.unesco.org/en/list/578 [Accessed February 2020]

World Heritage Convention (WHC) 2021. World Heritage List. Available online: https://whc.unesco.org/en/list [Accessed June 2021].

## 15.10. Key Ecological Features

Anderson, T.J., Nichol, S., Radke L., Heap, A.D., Battershill C., Hughes, M., Siwabessy, P.J., Barrie, V., Alvarez de Glasby, B., Tran, M., Daniell, J. and Shipboard Party.(2011) Seabed Environments of the Eastern Joesph Bonaparte Gulf, Norther Australia GA0325/Sol5117 – Post-Survey Report. GeoScience Australia, Canberra, Australian Capital Territory.

Baker C, Potter A, Tran M, Heap AD (2008) Geomorphology and sedimentology of the North-west Marine Region of Australia. Record 2008/07, Geoscience Australia, Canberra

Bannister, J.L., C.M. Kemper & R.M. Warneke (1996). The Action Plan for Australian Cetaceans., Canberra: Australian Nature Conservation Agency. http://www.environment.gov.au/resource/action-plan-australian-cetaceans

Blaber SJM, Dichmont CM, Buckworth RC, Badrudin, Sumiono B, Nurhakim, Iskandar B, Fegan B, Ramm DC & Salini JP (2005) Shared stocks of snappers (Lutjanidae) in Australia and Indonesia: integrating biology, population dynamics and socio-economics to examine management scenarios, Reviews in Fish Biology and Fisheries, vol. 15, pp. 111-127

Blaber SJM, Dichmont CM, White W, Buckworth R, Sadiyah L, Iskandar B, Nurhakim S, Pillans R, Andamari R, Dharmadi & Fahmi (2009) Elasmobranchs in southern Indonesian fisheries: the fisheries, the status of the stocks and management options, Reviews in Fish Biology and Fisheries, vol. 19, pp. 367-391

Burford, MA, Rothlisberg, PC & Revill, AT, (2009). Sources of nutrients driving production in the Gulf of Carpentaria, Australia: a shallow tropical shelf system. Marine and Freshwater Research, 60: 1-10.

Caton A & McLoughlin, K, (Eds) (2004). Fishery status reports 2004: status of fish stocks managed by the Australian Government., Bureau of Rural Sciences, Canberra.

Department of Agriculture, Water and the Environment (2002) – Australian Heritage Database http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;search=list_code%3DCHL%3Blegal_status%3D35%3Bkeyword_PD%3D0%3Bkeyword_SS%3D0%3Bkeyword_PH%3D0;place_id=105655 [Accessed June 2021].

DEH (Australian Government Department of the Environment and Heritage), (2006). A Guide to the Integrated Marine and Coastal Regionalisation of Australia Version 4.0., Department of the Environment and Heritage, Canberra, Australia.

DEWHA (2007). Characterisation of the marine environment of the north marine region: outcomes of an expert workshop convened in Darwin., Northern Territory, 2-3 April 2007, DEWHA, Canberra. http://www.environment.gov.au/resource/characterisation-marine-environment-north-marine-region-outcomes-expert-workshop-2-3-april

DEWHA (2008a). The North Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems, Conservation Values and Uses of the North Marine Region. Canberra: DEWHA.

DoEE (2016a) Thrombolite (microbialite) Community of a Coastal Brackish Lake (Lake Clifton) in Community and Species Profile and Threats Database, Department of the Environment, Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=96&status=Critically+Endangered. [Accessed 2016-08-02T13:56:21AEST]

DoEE (2016b) Monsoon vine thickets on the coastal sand dunes of Dampier Peninsula in Community and Species Profile and Threats Database, Department of the Environment, Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=105. Accessed 2016-08-02T14:04:23AEST

DSEWPaC (Department of Sustainability, Environment, Water, Population and Communities) (2012d) Commonwealth marine environment report card. Commonwealth of Australia

EA 2000. Mermaid Reef Marine National Nature Reserve Plan of Management 2000-2007. Environment Australia, Canberra, Australian Capital Territory

EA (Environment Australia) (2002) Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve (Commonwealth waters) management plans. EA, Canberra

Exon, NF, Hill, PJ, Mitchell, C & Post, A (2005). Nature and origin of the submarine Albany canyons off southwest Australia. Australian Journal of Earth Sciences, 52: 101-115.

Government of Western Australia (2010). Browse Liquified Natural Gas Plant Strategic Assessment Report. Part 4 Environmental Assessment – Terrestrial Impacts. December 2010.

Heyward A, Pinceratto E, Smith L (1997) Big bank shoals of the Timor Sea: an environmental resource atlas. Australian Institute of Marine Science, Melbourne

Hodgson, P (1995). Directory of Important Wetlands in Australia - Information sheet (Shoal Bay – Micket Creek NT032). Compiled by Wetlands Unit, Australian Nature Conservation Agency. Minor additions by S. J. Moore of Moore Environmental Consulting and L. N. Lloyd of Lloyd Environmental Consultants in 1999. DEO-NT update 1999. Available online: https://www.environment.gov.au/cgi-bin/wetlands/report.pl [Accessed June 2021].

Hooper JNA, Ekins M (2004) 'Collation and validation of museum collection databases related to the distribution of marine sponges in Northern Australia. Unpublished report to the National Oceans Office, Hobart

Jaensch, RP (1993).Directory of important wetlands in Australia. Compiled for the Wildlife Division, Conservation Commission of the Northern Territory, January-February 1993. Updated by P. Whitehead and R. Chatto November 1995. Database available online: https://www.environment.gov.au/cgi-bin/wetlands/report.pl [Accessed June 2021].

Kemps, H (2010) Ningaloo: Australia's Untamed Reef. Quinns Rocks: MIRG Australia.

Limpus C (2008) A biological review of Australian marine turtles 2. Green turtle *Chelonis mydas* (Linnaeus). Environment Protection Agency, Queensland

McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, N. Jenner M-, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch & K. McCabe, (2000). Marine seismic surveys: analysis and propagation of air-gun signals; and effects of exposure on humpback whales, sea turtles, fishes and squid., Prepared for the Australian Petroleum Production & Exploration Association (APPEA) by the Centre for Marine Science and Technology, Curtin University of Technology, R99-15.

NERP MBH National Environmental Research Program Marine Biodiversity Hub (2014). Exploring the Oceanic Shoals Commonwealth Marine Reserve., NERP MBH, Hobart.

Northern Territory Government (ND). Charles Darwin National Park Plan of Management. Available online: https://depws.nt.gov.au/__data/assets/pdf_file/0005/249044/charlesdarwinpom.pdf

Parks And Wildlife Commission of the Northern Territory (2011). Cobourg Marine Park Plan of Management. Prepared by the Cobourg Peninsula Sanctuary and Marine Park Board and Parks and Wildlife Service of the Northern Territory, Department of Natural Resources, Environment, The Arts and Sport Available online: https://depws.nt.gov.au/__data/assets/pdf_file/0006/249045/Cobourg-Marine-Park.pdf

Parks And Wildlife Commission of the Northern Territory (2015). Mary River National Park Joint Management Plan March 2015. Available online: https://depws.nt.gov.au/__data/assets/pdf_file/0006/260493/Mary-River-final-JMP_March2015_sml.pdf

Parks And Wildlife Commission of the Northern Territory (2016). Casuarina Coastal Reserve Management Plan April 2016

Richardson, L, Mathews, E & Heap, A, (2005). Geomorphology and sedimentology of the south western planning area of Australia: review and synthesis of relevant literature in support of regional marine planning., Record 2005/17, Geoscience Australia, Canberra.

Rowden, AA, Dower, JF, Schlacher, TA, Consalvey, M, Clark, MR (2010). Paradigms in seamount ecology: fact, fiction and future. Marine Ecology, 31: 226-241.

Salini JP, Ovenden JR, Street R, Pendrey R, Haryanti & Ngurah (2006) Genetic population structure of red snappers (*Lutjanus malabaricus* Bloch & Schneider, 1801 and *Lutjanus erythropterus* Bloch, 1790) in central and eastern Indonesia and Australia, Journal of Fish Biology, vol. 68 (supplement B), pp. 217-234

Sleeman JC, Meekan MG, Wilson SG, Jenner CKS, Jenner MN, Boggs GS, Steinberg CC, Bradshaw CJA (2007) 'Biophysical correlates of relative abundances of marine megafauna at Ningaloo Reef, Western Australia', Marine and Freshwater Research, vol. 58, pp. 608–623

Smith, ADM, Hobday, AJ, Webb, H, Daley, R, Wayte, S, et al., (2006). Ecological risk assessment for the effects of fishing., Final report R04/1072 for the Australian Fisheries Management Authority, Canberra.

Stambler N (2011) Zooxanthellae: the yellow symbionts inside animals, in Dubinsky Z, Stambler N (eds), Coral reefs: an ecosystem in transition. Springer, London

Stow, DAV (2006). Oceans: an illustrated reference., University of Chicago Press.

Underwood JN (2009) Genetic diversity and divergence among coastal and offshore reefs in a hard coral depend on geographic discontinuity and oceanic currents. Evolutionary Applications 2: 1–11

Underwood JN, Smith LD, van Oppen MJH, Gilmour J (2009) Ecologically relevant dispersal of a brooding and a broadcast spawning coral at isolated reefs: implications for managing community resilience. Ecological Applications 19: 18–29

Wightman, G, Danaher, K, Dunning, M, Beumer, J & Michie, M, (2004). Mangroves. National Oceans Office, (Eds). A description of key species groups in the northern planning area, National Oceans Office, Hobart.

Bannister, JL, Josephson, EA, Reeves, RR & Smith, TD, (2007). There she blew! Yankee sperm whaling grounds, 1760-1920. DJ Starkey, P Holm & M Barnard, (Eds). Oceans past: management insights from the history of marine animal populations, Earthscan Research Editions, Oxford.

Brewer DT, Lyne V, Skewes TD, Rothlisberg, P (2007) Trophic systems of the North West Marine Region. Report to the Australian Government Department of the Environment and Water Resources, CSIRO, Cleveland

Currey-Randall, M, Galaiduk, R, Stowar, M, Vaughan, B.I and K. J. Miller (2021) Mesophotic fish communities of the ancient coastline in Western Australia. PLoS ONE 16(4): e0250427. https://doi.org/10.1371/journal.pone.0250427Dambacher, JM, Rochester, W & Dutra, L, (2009). Addendum to ecological indicators for the exclusive economic zone waters of the South-west Marine Region., report for the Australian Government Department of the Environment, Water, Heritage and the Arts, Canberra.

DEWHA (2008b). The South-West Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems, Conservation Values and Uses of the South-West Marine Region. Canberra: DEWHA.

DEWHA (2008c) A characterisation of the marine environment of the North-west Marine Region: Perth workshop report. A summary of an expert workshop convened in Perth, Western Australia. 5-6 September 2007, DEWHA, Hobart

DEWHA (2008d) The North-west Marine bioregional plan: bioregional profile. A description of the ecosystems, conservation values and uses of the North-west Marine Bioregion. DEWHA, Canberra

DEWHA, (2010). Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*), Technical Issues Paper., Australian Government, Canberra.

Done TJ, Williams DMcB, Speare PJ, Davidson J, DeVantier LM, Newman SJ, Hutchins JB (1994) Surveys of coral and fish communities at Scott Reef and Rowley Shoals. Australian Institute of Marine Science, Townsville

Donovan A, Brewer D, van der Velde T, Skewes T (2008) Scientific descriptions of four selected key ecological features in the North-west Bioregion: final report. Report to the Australian Government Department of Environment, Water, Heritage and the Arts, CSIRO Marine and Atmospheric Research, Cleveland

DSEWPaC (Department of Sustainability, Environment, Water, Population and Communities) (2012) Commonwealth marine environment report card. Commonwealth of Australia

DSEWPaC (Department of Sustainability, Environment, Water, Population and Communities) (2012b) Marine bioregional plan for the South-west Marine Region

DSEWPaC (Department of Sustainability, Environment, Water, Population and Communities) (2012c) Commonwealth marine environment report card: supporting the marine bioregional plan for the South-west Marine Region

Falkner I, Whiteway T, Przeslawski R, Heap AD (2009) Review of ten key ecological features in the Northwest Marine Region. Record 2009/13, Geoscience Australia, Canberra

Fletcher WJ, Santoro K (eds) (2009) State of the fisheries report 2008/09. Department of Fisheries, Western Australia, Perth

Gilmour, J, Cheal, A, Smith, L, Underwood, J, Meekan, M, Fitzgibbon, B & Rees, M, (2007). Data compilation and analysis for Rowley Shoals: Mermaid, Imperieuse and Clerke reefs., Report to the Department of Environment and Water Resources, Australian Institute of Marine Science, Perth.

Guinea, M, (2006). Sea turtles, sea snakes and dugongs of Scott Reef, Seringapatam Reef and Browse Island with notes on West Lacepede Island., Report submitted to the Australian Government Department of the Environment, Water, Heritage and the Arts, Canberra.

Heap AD, Harris PT (2008) Geomorphology of the Australian margin and adjacent sea floor. Australian Journal of Earth Sciences 55:555–585

Jenner C, Jenner M, Pirzl R (2008) A study of cetacean distribution and oceanography in the Scott Reef/Browse Basin development areas during the austral winter of 2008. Centre for Whale Research (WA), Perth

Last P, Lyne V, Yearsley G, Gledhill D, Gomon M, Rees T, White, W (2005) Validation of national demersal fish datasets for the regionalisation of the Australian continental slope and outer shelf (>40 m depth). Australian Government Department of the Environment and Heritage & CSIRO Marine and Atmospheric Research, Hobart

Lyne V, Fuller M, Last P, Butler A, Martin M, Scott R (2006) Ecosystem characterisation of Australia's North West Shelf. North West Shelf Joint Environmental Management Study Technical Report 12, CSIRO Marine and Atmospheric Research, Hobart

McClatchie, S, Middleton, J, Pattiaratchi, C, Currie, D & Kendrick, G, (Eds), (2006). The South-west Marine Region: ecosystems and key species groups., Australian Government Department of the Environment and Water Resources, Canberra.

McLoughlin RJ, Young PC (1985) Sedimentary provinces of the fishing grounds of the North West Shelf of Australia: grain-size frequency analysis of surficial sediments. Australian Journal of Marine and Freshwater Research 36: 671–81

Milton DA (2005) Birds of Ashmore Reef National Nature Reserve: an assessment of its importance for seabirds and waders. The Beagle, Records of the Museums and Art Gallery of the Northern Territory, suppl. 1: 133–141

Pattiaratchi, C, (2007). Understanding areas of high productivity within the South-west Marine Region., Report to the Department of the Environment, Water, Heritage and the Arts, Canberra.

Wakeford M, Puotinen M, Nicholas W, Colquhoun J, Vaughan BI, Whalan S, et al. (2023) Mesophotic benthic communities associated with a submerged palaeoshoreline in Western Australia. PLoS ONE 18(8): e0289805. https://doi.org/10.1371/journal.pone.0289805

Whiting S (1999) Use of the remote Sahul Banks, northwestern Australia, by dugongs, including breeding females. Marine Mammal Science 15: 609–615

Williams, A, Koslow, JA & Last, PR (2001). Diversity, density and community structure of the demersal fish fauna of the continental slope off western Australia (20 to 35° S). Marine Ecology Progress Series, 212: 247-63.

# 15.11. State Marine Parks

CALM (1999) Swan Estuary Marine Park and Adjacent Nature Reserves Management Plan 1999-2009. Management Plan No. 41. Department of Conservation and Land Management.

CALM (2002) Management Plan for Marmion Marine Park 1992-2002: Management Plan No.23. Department of Conservation and Land Management.

CALM (2004) Indicative Management Plan for the Proposed Montebello/Barrow Islands Marine conservation Reserves, 2004.Marine Conservation Branch, Department of Conservation and Land Management.

DBCA (2020a). Proposed Mayala Marine Park Indicative Joint Management Plan 2020. Department of Biodiversity, Conservation and Attractions, Perth, Western Australia. Accessible from: https://www.dpaw.wa.gov.au/images/documents/conservation-management/managementplans/Proposed%20Mayala%20Marine%20Park%20indicative%20joint%20management%20plan.pdf

DBCA (2020b). Lalang-gaddam amended Joint Management Plan for the Lalang-garram / Camden Sound, Lalang-garram / Horizontal Falls and North Lalang-garram Marine Parks and Indicative Joint Management Plan for the Proposed Maiyalam Marine Park. Department of Biodiversity, Conservation and Attractions, Perth, Western Australia. Accessible from: https://www.dpaw.wa.gov.au/images/documents/conservation-management/managementplans/Lalang-gaddam%20marine%20park%20amended%20and%20indicative%20joint%20management%20plan.pdf

DBCA (2022a). Bardi Jawa Gaarra Marine Park Joint Management Plan 2022. Joint Management Plan 99. Department of Biodiversity, Conservation and Attractions, Perth, Western Australia. Accessible from: https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/Bardi%20Jawi%20Gaarra%20Marine%20Park%20Joint%20Management%20Plan.pdf

DBCA, (2022b). Mayala Marine Park Joint Management Plan 2022 Management Plan 100. Department of Biodiversity, Conservation and Attractions, Perth, Western Australia. Accessible from: Mayala Marine Park | Department of Biodiversity, Conservation and Attractions (dbca.wa.gov.au)

DEC (2005) Jurien Bay Marine Park Management Plan 2005– 2015, Management plan number 49. Department of Environment and Conservation, Perth, Western Australia

DEC (2007c). Management Plan for the Shoalwater Islands Marine Park 2007-2017: Management Plan No. 58. Department of Environment and Conservation, Perth, Western Australia.

DEC (2009b) Walpole and Nornalup Inlets Marine Park Management Plan 2009-2019. Management Plan No. 62. Department of Environment and Conservation, Perth, Western Australia.

DEC (2013) Ngari Capes Marine Park management plan 2013– 2023, Management plan number 74. Department of Environment and Conservation, Perth.

DPAW 2013. Lalang-garram/ Camden Sound Marine Park Management Plan 73 2013–2023. Department of Parks and Wildlife, Perth, Western Australia

DEWHA (2008) The North-west Marine Bioregional Plan: Bioregional profile: A Description of the Ecosystems, Conservation Values and Uses of the North-West Marine Region. Department of the Environment Water, Heritage and the Arts, Canberra, ACT.

DPaW 2016, Lalang-garram/ Horizontal Falls and North Lalang-garram marine parks joint management plan 2016. Management Plan 88. Department of Parks and Wildlife, Perth.

DoEE (2019c), Australia's National Heritage List. Available from: http://www.environment.gov.au/heritage/places/national-heritage-list [Accessed 16 December 2019].

DPaW (2013) Lalang-garram / Camden Sound Marine Park management plan no. 73 2013–2023, Department of Parks and Wildlife, Perth, Western Australia.

DPaW (2013a) New and proposed marine parks and reserves. Online, retrieved 23rd April 2014. Available at: https://www.dbca.wa.gov.au/parks-and-wildlife-service/plan-for-our-parks

DPaW (2014) Eighty Mile Beach Marine Park Management Plan 2014-2024. Management Plan No. 80. Department of Parks and Wildlife, Perth, Western Australia.

Department of Parks and Wildlife (2016a). North Kimberley Marine Park Joint management plan 2016 Uunguu, Balanggarra, Miriuwung Gajerrong, and Wilinggin management areas, Number Plan 89 Department of Parks and Wildlife, Perth.

[NT] Nothern Territory Government. 2023. Garig Gunak Barlu National Park Fact Sheet. Accessible from: Garig Gunak Barlu National Park | NT.GOV.AU [17 Jan 2024]

[DoNP] Director of National Parks. 2016. Kakadu National Park Management Plan 2016 -2026. Accessible from: Kakadu National Park Management Plan 2016-2026 (dcceew.gov.au)

AHC (2006) Cape Range National Park and Surrounds, Exmouth, WA. A WWW publication accessed December 2006 at http://www.environment.gov.au/. Australian Heritage Commission, Canberra.

CALM (1996) Shark Bay Marine Reserves. Management Plan. 1996-2006. Marine Conservation Branch, Management Plan No. 34. Department of Conservation and Land Management.

CALM (2005) Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area 2005 – 2015 Management Plan No. 52. Department of Conservation and Land Management, Perth, Western Australia.

DBCA (2017b). Explore Parks WA: Yawuru Nagulagun/Roebuck Bay Marine Park. Accessible from: https://parks.dpaw.wa.gov.au/park/yawuru-nagulagun-roebuck-bay. [20 Dec 2017]

DEC (2007a) Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves 2007–2017: Management Plan No. 55. Department of Environment and Conservation, Perth, Western Australia.

DEC (2007b) Management Plan for the Rowley Shoals Marine Park 2007–2017: Management Plan No. 56. Department of Environment and Conservation, Perth, Western Australia.

DEC (2010). Shark Bay Marine Park and Hamelin Pool Marine Nature Reserve Recreational Guide. Available at: https://parks.dpaw.wa.gov.au/sites/default/files/downloads/parks/20180017%20WEB%20VERSION%20SHARK%20BAY%20MARINE%20RESERVES.pdf [Accessed January 2015]

Department of Biodiversity, Conservation and Attractions, DBCA (2017a). Parks and Wildlife Services: Approved Management Plans. Accessible from: https://www.dpaw.wa.gov.au/parks/management-plans/approved-management-plans. [20 Dec 2017]

Department of Parks and Wildlife, DPaW (2016b). Yawuru Nagulagun/Roebuck Bay Marine Park: Joint management plan 2016.

DPAW 2014. Eighty Mile Beach Marine Park Management Plan 80 2014-2024. Department of Parks and Wildlife, Perth, Western Australia

DSEWPaC (2013a) Shark Bay, Western Australia, Work Heritage Values. [Online, retrieved 17 July 2013] Available at: https://www.environment.gov.au/heritage/places/world/shark-bay

Yawuru Organisation (2017). Environmental Services for Yawuru Protected Areas. Accessible from: http://www.yawuru.org.au/country/environmental-services/. [20 Dec 2017]

## 15.12. Australian Marine Parks

DSEWPaC (2012) Marine bioregional plan for the North-west Marine Region. Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT. 269 pp.

Director of National Parks (2012a) Concerning the Proposed Proclamation of 40 Commonwealth marine reserves (and the related revocation of seven existing Commonwealth reserves and the revocation of the Coral Sea Conservation Zone); and the amendment of the names of four existing Commonwealth marine reserves. Report to the Director of National Parks under the Environment Protection and Biodiversity Conservation Act 1999 Section 351.

Director of National Parks (2018a), South-west Marine Parks Network Management Plan 2018, Director of National Parks, Canberra.

Director of National Parks (2018b), North-west Marine Parks Network Management Plan 2018, Director of National Parks, Canberra.

# 15.13. Conservation Management Plans

Hill, R. and Dunn A. (2004), National Recovery Plan for the Christmas Island Frigatebird *Fregata andrewsi.* Commonwealth of Australia, Canberra.

Threatened Species Scientific Committee (2020a). Conservation Advice for the Christmas Island Frigatebird *Fregeta andrewsii.* Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1011-conservation-advice-19102020.pdf. In effect under the EPBC Act from 19-Oct-2020.

Threatened Species Scientific Committee (2019), Conservation Advice for *Botaurus poiciloptilus* (Australasian Bittern). Canberra, ACT: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1001-conservation-advice-18012019.pdf. In effect under the EPBC Act from 18-Jan-2019.

Threatened Species Scientific Committee (2015). Conservation Advice *Halobaena caerulea* blue petrel. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1059-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (2015). Conservation Advice *Pachyptila turtur subantarctica* fairy prion (southern). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/64445-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

[AMPa] Australian Marine Parks. 2024. Christmas Island Marine Park Values Statement. Accessible from: Christmas Island Marine Park | Australian Marine Parks (parksaustralia.gov.au) [17 January 2024]

[AMPb] Australian Marine Parks. 2024. Cocos (Keeling) Islands Marine Parks Values Statement. Accessible from: amp-iot-cki-values-statements.pdf (parksaustralia.gov.au) [17 January 2024)

Commonwealth of Australia (2012), Conservation Management Plan for the Southern Right Whale - A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999 2011 - 2021, Commonwealth of Australia, 2012.

Commonwealth of Australia (2013), Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) 2013.

Commonwealth of Australia (2013), Recovery Plan for the White Shark (*Carcharodon carcharias*) 2013.

Commonwealth of Australia (2014), Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) 2014.

Commonwealth of Australia (2015), Conservation Management Plan for the Blue Whale—A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999, Commonwealth of Australia, 2015.

Commonwealth of Australia (2015), Sawfish and River Sharks - Multispecies Recovery Plan 2015.

Commonwealth of Australia (2015), Wildlife Conservation Plan for Migratory Shorebirds, Commonwealth of Australia, 2015

Commonwealth of Australia (2017), Recovery Plan for Marine Turtles in Australia 2017 – 2027.

Commonwealth of Australia (2020), National Recovery Plan for the Australian Fairy Tern (Sternula nereis nereis) 2020

Commonwealth of Australia (2020), Wildlife Conservation Plan for Seabirds, Commonwealth of Australia 2020

DCCEEW, 2024c. DCCEEW Recovery Plans Website. Accessible at: https://www.dcceew.gov.au/environment/biodiversity/threatened/recovery-plans#:~:text=listed%20under%20the%20Commonwealth%20Environment,species%20or%20threatened%20ecological%20communities. [accessed on 17 April 2024]

Department of Agriculture, Water and the Environment (2020). *National Recovery Plan for the Australian Fairy Tern* (Sternula nereis nereis). Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.dcceew.gov.au/environment/biodiversity/threatened/publications/recovery/fairy-tern-2022. In effect under the EPBC Act from 05-May-2022 as *Sternula nereis nereis*.

Department of Climate Change, Energy, the Environment and Water (2022). *National Recovery Plan for albatrosses and petrels*. Department of Climate Change, Energy, the Environment and Water, Canberra. Available

from: http://www.dcceew.gov.au/environment/biodiversity/threatened/publications/recovery/albatrosses-and-petrels-2022. In effect under the EPBC Act from 01-Oct-2022 as *Thalassarche cauta*.

Department of Sustainability, Environment, Water, Population and Communities (2011), National recovery plan for threatened albatrosses and giant petrels 2011-2016, Commonwealth of Australia, Hobart

Department of Sustainability, Environment, Water, Population and Communities (2013). Approved Conservation Advice for *Rostratula australis* (Australian painted snipe). Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/77037-conservation-advice.pdf. In effect under the EPBC Act from 15-May-2013.

Department of Sustainability, Environment, Water, Population and Communities (2011). Approved Conservation Advice for *Sternula nereis nereis* (Fairy Tern). Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/82950-conservation-advice.pdf. In effect under the EPBC Act from 03-Mar-2011.

Department of Sustainability, Environment, Water, Population and Communities (2011). Approved Conservation Advice for *Aipysurus apraefrontalis* (Short-nosed Sea Snake). Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1115-conservation-advice.pdf. In effect under the EPBC Act from 15-Feb-2011.

Department of Sustainability, Environment, Water, Population and Communities (2011). Approved Conservation Advice for *Aipysurus foliosquama* (Leaf-scaled Sea Snake). Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1118-conservation-advice.pdf. In effect under the EPBC Act from 15-Feb-2011.

Department of the Environment (2014). Approved Conservation Advice for *Glyphis garricki* (northern river shark). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/82454-conservation-advice.pdf. In effect under the EPBC Act from 11-Apr-2014.

Department of the Environment (2014). Approved Conservation Advice for *Pristis pristis* (largetooth sawfish). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/60756-conservation-advice.pdf. In effect under the EPBC Act from 11-Apr-2014.

Department of the Environment (2014). Conservation Advice *Phaethon lepturus fulvus* white-tailed tropicbird (Christmas Island). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/26021-conservation-advice.pdf. In effect under the EPBC Act from 06-Nov-2014.

Department of the Environment (2015). Conservation Advice *Calidris ferruginea* curlew sandpiper. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/856-conservation-advice.pdf. In effect under the EPBC Act from 26-May-2015.

Department of the Environment (2015). Conservation Advice *Numenius madagascariensis* eastern curlew. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/847-conservation-advice.pdf. In effect under the EPBC Act from 26-May-2015.

Department of the Environment, Water, Heritage and the Arts (2008). Approved Conservation Advice for *Dermochelys coriacea* (Leatherback Turtle). Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1768-conservation-advice.pdf. In effect under the EPBC Act from 08-Jan-2009.

Department of the Environment, Water, Heritage and the Arts (2008). Approved Conservation Advice for Green Sawfish. Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/68442-conservation-advice.pdf. In effect under the EPBC Act from 07-Mar-2008.

Department of the Environment, Water, Heritage and the Arts (2009). Approved Conservation Advice for *Pristis clavata* (Dwarf Sawfish). Canberra, ACT: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/68447-conservation-advice.pdf. In effect under the EPBC Act from 20-Oct-2009.

Threatened Species Scientific Committee (2015). Conservation Advice *Anous tenuirostris melanops* Australian lesser noddy, Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/26000-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (2015). Conservation Advice *Pterodroma Mollis* soft-plumaged petrel. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1036-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (2015). Conservation Advice *Balaenoptera borealis* sei whale. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/34-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (2015). Conservation Advice *Balaenoptera physalus* fin whale. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/37-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (2015). Conservation Advice *Megaptera novaeangliae* humpback whale. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/38-conservation-advice-10102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (2015). Conservation Advice *Rhincodon typus* whale shark. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66680-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.

Threatened Species Scientific Committee (2016). Conservation Advice *Calidris canutus* Red knot. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs855-conservation-advice-05052016.pdf. In effect under the EPBC Act from 05-May-2016.

Threatened Species Scientific Committee (2016). Conservation Advice *Charadrius leschenaultii* Greater sand plover. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/877-conservation-advice-05052016.pdf. In effect under the EPBC Act from 05-May-2016.

Threatened Species Scientific Committee (2016). Conservation Advice *Limosa lapponica baueri* Bar-tailed godwit (western Alaskan). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/86380-conservation-advice-05052016.pdf. In effect under the EPBC Act from 05-May-2016.

Threatened Species Scientific Committee (2016). Conservation Advice *Limosa lapponica menzbieri* Bar-tailed godwit (northern Siberian). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/86432-conservation-advice-05052016.pdf. In effect under the EPBC Act from 05-May-2016.

Threatened Species Scientific Committee (2020b). Conservation Advice the Abbott's booby *Papasula abbotti*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/59297-conservation-advice-19102020.pdf. In effect under the EPBC Act from 19-Oct-2020.

Threatened Species Scientific Committee (2020c). Conservation Advice for *Thalassarche cauta* Shy Albatross. Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/89224-conservation-advice-03072020.pdf. In effect under the EPBC Act from 03-Jul-2020.

## 15.14. Commercial and Recreational Fisheries

Apache (2008) Van Gogh Oil Development Draft Public Environmental Report (EPBC Referral 2007/3213). Apache Energy Ltd, Perth, Western Australia, February 2008.

Caputi, N., Jackson, G. and Pearce, A. (2014). The marine heat wave off Western Australia during the summer of 2010/11 – 2 years on. Fisheries Research Report No. 250. Department of Fisheries, Western Australia. 40pp.

Condie SA, Mansbridge JV, Hart AM and Andrewartha JR (2006) Transport and Recruitment of Silver-lip Pearl Oyster Larvae on Australia's North West Shelf. In Journal of Shellfish Research, Vol. 25, No. 1. pp 179 – 185.

Department of Agriculture (2019) Fishery Status Reports 2019. Department of Agriculture, Canberra, Australian Capital Territory.

DPIRD (2018) Department of Primary Industries and Regional Development. Annual Report 2018. Government of Western Australia.

DPIRD (2020) Department of Primary Industries and Regional Development. Aquaculture. Development Plan for Western Australia. Government of Western Australia.

Environmental Resources Management (ERM) 2008, Indonesian Fishers SIA Report (Phase 1) 2007. Report produced for Woodside Energy Limited. 170 pp.

Environmental Resources Management (ERM) 2009, Browse LNG Development: Social Study on Indonesian Fishers (Phase 2) 2008. Report produced for Woodside Energy Limited. 93 pp

Fletcher, W J and Santoro, K. (2013) Status Reports of the Fisheries and Aquatic Resources of Western Australia 2012/13 (eds).: The State of the Fisheries. Department of Fisheries, Western Australia.

Fletcher, W.J. and Santoro, K. (eds). (2015). Status Reports of the Fisheries and Aquatic Resources of Western Australia 2014/15: The State of the Fisheries. Department of Fisheries, Western Australia.

Gaughan, D.J., Molony, B. and Santoro, K. (eds). 2019. Status Reports of the Fisheries and Aquatic Resources of Western Australia 2017/18: The State of the Fisheries. Department of Primary Industries and Regional Development, Western Australia.

Gaughan, D.J. and Santoro, K. (eds). 2020. Status Reports of the Fisheries and Aquatic Resources of Western Australia 2018/19: The State of the Fisheries. Department of Primary Industries and Regional Development, Western Australia.

Newman, S.J., Santoro, K.G. and Gaughan, D.J. (eds). 2023. Status Reports of the Fisheries and Aquatic Resources of Western Australia 2022/23: The State of the Fisheries. Department of Primary Industries and Regional Development, Western Australia.

Thomas, L and K.J. Miller (2022) High gene flow in the silverlip pearl oyster *Pinctada maxima* between inshore and offshore sites near Eighty Mile Beach in Western Australia. PeerJ 10:e13323 https://doi.org/10.7717/peerj.13323

WAFIC 2016. Western Australia Fishing Industry Council Incorporated. Available at: http://www.wafic.org.au/region/west-coast/ [Accessed August 2016]

Whalan S, Puotinen M, Wakeford M, Parnum I and Miller K (2021) Distribution of the Pearl Oyster Pinctada maxima off Eighty Mile Beach, Western Australia. Front. Mar. Sci. 8:679749. doi: 10.3389/fmars.2021.679749

Woodside Energy Limited (Woodside) (2011) Browse LNG Development, Draft Upstream Environmental Impact Statement, EPBC Referral 2008/4111, November 2011.

# 15.15. Social and Economic Features

AMSA (Australian Marine Safety Authority) (2012) Marine Notice 15/2012, Shipping Fairways off the north-west coast of Australia. Australian Maritime Safety Authority, Australian Government

AMSA (2013) North West Shipping Management. Australian Maritime Safety Authority. Canberra.

DBCA (Department of Biodiversity, Conservation and Attractions). (2022). Houtman Abrolhos Islands National Park management plan 97, 2022. Department of Biodiversity, Conservation and Attractions, Perth.

DEC (Department of Environment and Conservation). (2007). MANAGEMENT PLAN FOR THE MONTEBELLO/BARROW ISLANDS MARINE CONSERVATION RESERVES 2007-2017. Management Plan No. 55, Department of Environment and Conservation

DoE (Department of Environment) (2014) Australian Heritage Database. Available at http://www.environment.gov.au/cgi-bin/ahdb/search.pl [Accessed June 2021]

DMP (Department of Mines and Petroleum) (2014) Petroleum in Western Australia. East Perth, Western Australia, April 2014.

Shire of Exmouth (2018) HEH Naval Communication Station. Available at https://www.exmouth.wa.gov.au/Profiles/exmouth/Assets/ClientData/Ningaloo_Coast_World_Heritage_Area_Cultural_History.pdf [Accessed April 2014]

Royal Australian Air Force (RAAF) (2014) Bases Western Australia. Available at https://www.airforce.gov.au/about-us/bases [Accessed April 2014]

Tourism Western Australia (2014) Visitor Fact Sheets – Tourism Regional Level. Available at http://www.tourism.wa.gov.au/Research_and_Reports/Regional_Fact_Sheets/Pages/Regional_Fact_Sheets.aspx [Accessed April 2014]

# Appendix D Protected Matters Search Tool Reports

There are five separate PMST searches:

- The first four are the operational areas within Commonwealth waters
- The last search output is derived from the socio-economic EMBA, being that with the largest extent and that which has been used to create the EP figures throughout.

The PMST search order is as follows;

1. Mestrel/Bancroft OA
2. Ara OA
3. Curie OA
4. Wallace OA
5. EMBA (Socio-economic EMBA used for search purposes).

The searches are completed using the exact coordinates that are used to produce the figures throughout Section 3 of the EP, ensuring that the EMBA encompasses the full range of environmental receptors that might be contacted by surface and subsurface hydrocarbons at the low exposure level in the highly unlikely event of a worst-case oil spill.

The coordinates are also provided within the PMST report to allow for duplication of the search and verification if required.

Santos do not have control over the PMST search tool output, but instead have provided the reports and coordinates to ensure transparency.

# PMST - Mestrel/Bancroft OA

# 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. Please see the caveat for interpretation of information provided here.

Report created: 23-Apr-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

# Summary

## Matters of National Environment 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 (Ramsar | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 1 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 19 |
| Listed Migratory Species: | 34 |

## 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 https://www.dcceew.gov.au/parks-heritage/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 Lands: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 58 |
| Whales and Other Cetaceans: | 25 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |
| Habitat Critical to the Survival of Marine Turtles: | None |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Nationally Important Wetlands: | None |
| EPBC Act Referrals: | 10 |
| Key Ecological Features (Marine): | 1 |
| Biologically Important Areas: | 4 |
| Bioregional Assessments: | None |
| Geological and Bioregional Assessments: | None |

# Details

## Matters of National Environmental Significance

### Commonwealth Marine Area [ Resource Information ]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

| Feature Name | Buffer Status |
|---|---|
| Commonwealth Marine Areas (EPBC Act) | In feature area |

### Listed Threatened Species [ Resource Information ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| BIRD | | | |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area | In feature area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area | In feature area |
| Phaethon rubricauda westralis<br>Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824] | Endangered | Species or species habitat likely to occur within area | In feature area |
| MAMMAL | | | |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Balaenoptera borealis](#)<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Balaenoptera musculus](#)<br>Blue Whale [36] | Endangered | Migration route known to occur within area | In feature area |
| [Balaenoptera physalus](#)<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| REPTILE | | | |
| [Caretta caretta](#)<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Chelonia mydas](#)<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Dermochelys coriacea](#)<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Eretmochelys imbricata](#)<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Natator depressus](#)<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| SHARK | | | |
| [Carcharodon carcharias](#)<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Pristis pristis](#)<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Pristis zijsron](#)<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Rhincodon typus | | | |
| Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Sphyrna lewini | | | |
| Scalloped Hammerhead [85267] | Conservation Dependent | Species or species habitat known to occur within area | In feature area |

## Listed Migratory Species [ Resource Information ]

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Migratory Marine Birds | | | |
| Anous stolidus | | | |
| Common Noddy [825] | | Species or species habitat may occur within area | In feature area |
| Calonectris leucomelas | | | |
| Streaked Shearwater [1077] | | Species or species habitat likely to occur within area | In feature area |
| Fregata ariel | | | |
| Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |
| Fregata minor | | | |
| Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| Phaethon lepturus | | | |
| White-tailed Tropicbird [1014] | | Species or species habitat likely to occur within area | In feature area |
| Migratory Marine Species | | | |
| Anoxypristis cuspidata | | | |
| Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat known to occur within area | In feature area |
| Balaenoptera borealis | | | |
| Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera edeni | | | |
| Bryde's Whale [35] | | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Balaenoptera musculus](#)<br>Blue Whale [36] | Endangered | Migration route known to occur within area | In feature area |
| [Balaenoptera physalus](#)<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Carcharhinus longimanus](#)<br>Oceanic Whitetip Shark [84108] | | Species or species habitat likely to occur within area | In feature area |
| [Carcharias taurus](#)<br>Grey Nurse Shark [64469] | | Species or species habitat may occur within area | In feature area |
| [Carcharodon carcharias](#)<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Caretta caretta](#)<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Chelonia mydas](#)<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Dermochelys coriacea](#)<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Eretmochelys imbricata](#)<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Isurus oxyrinchus](#)<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area | In feature area |
| [Isurus paucus](#)<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat known to occur within area | In feature area |
| Mobula alfredi as Manta alfredi<br>Reef Manta Ray, Coastal Manta Ray [90033] | | Species or species habitat likely to occur within area | In feature area |
| Mobula birostris as Manta birostris<br>Giant Manta Ray [90034] | | Species or species habitat likely to occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In feature area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area | In feature area |
| Pristis pristis<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area | In feature area |
| **Migratory Wetlands Species** | | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Calidris acuminata](#)<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Calidris canutus](#)<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Calidris melanotos](#)<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area | In feature area |
| [Numenius madagascariensis](#)<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |

## Other Matters Protected by the EPBC Act

| Listed Marine Species | | | [ Resource Information ] |
|---|---|---|---|
| Scientific Name | Threatened Category | Presence Text | Buffer Status |
| Bird | | | |
| [Actitis hypoleucos](#)<br>Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |
| [Anous stolidus](#)<br>Common Noddy [825] | | Species or species habitat may occur within area | In feature area |
| [Calidris acuminata](#)<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Calidris canutus](#)<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area overfly marine area | In feature area |
| [Calidris melanotos](#)<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area overfly marine area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area | In feature area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area | In feature area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Species or species habitat likely to occur within area | In feature area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area | In feature area |
| Fish | | | |
| Campichthys tricarinatus<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area | In feature area |
| Choeroichthys brachysoma<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area | In feature area |
| Choeroichthys suillus<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area | In feature area |
| Corythoichthys flavofasciatus<br>Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Cosmocampus banneri<br>Roughridge Pipefish [66206] | | Species or species habitat may occur within area | In feature area |
| Doryrhamphus dactyliophorus<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area | In feature area |
| Doryrhamphus excisus<br>Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211] | | Species or species habitat may occur within area | In feature area |
| Doryrhamphus janssi<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area | In feature area |
| Filicampus tigris<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area | In feature area |
| Halicampus brocki<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area | In feature area |
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area | In feature area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area | In feature area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area | In feature area |
| Hippichthys penicillus<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area | In feature area |
| Hippocampus angustus<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Hippocampus histrix<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area | In feature area |
| Hippocampus kuda<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area | In feature area |
| Hippocampus planifrons<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area | In feature area |
| Hippocampus spinosissimus<br>Hedgehog Seahorse [66239] | | Species or species habitat may occur within area | In feature area |
| Micrognathus micronotopterus<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area | In feature area |
| Solegnathus hardwickii<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area | In feature area |
| Solegnathus lettiensis<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area | In feature area |
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area | In feature area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area | In feature area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area | In feature area |
| Trachyrhamphus longirostris<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area | In feature area |
| Reptile | | | |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Aipysurus duboisii<br>Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116] | | Species or species habitat may occur within area | In feature area |
| Aipysurus laevis<br>Olive Sea Snake, Olive-brown Sea Snake [1120] | | Species or species habitat may occur within area | In feature area |
| Aipysurus mosaicus as Aipysurus eydouxii<br>Mosaic Sea Snake [87261] | | Species or species habitat may occur within area | In feature area |
| Aipysurus tenuis<br>Brown-lined Sea Snake, Mjoberg's Sea Snake [1121] | | Species or species habitat may occur within area | In buffer area only |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Ephalophis greyae as Ephalophis greyi<br>Mangrove Sea Snake [93738] | | Species or species habitat may occur within area | In feature area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Hydrelaps darwiniensis<br>Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100] | | Species or species habitat may occur within area | In buffer area only |
| Hydrophis czeblukovi<br>Fine-spined Sea Snake [59233] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Hydrophis elegans<br>Elegant Sea Snake, Bar-bellied Sea Snake [1104] | | Species or species habitat may occur within area | In feature area |
| Hydrophis kingii as Disteira kingii<br>Spectacled Sea Snake [93511] | | Species or species habitat may occur within area | In feature area |
| Hydrophis macdowelli as Hydrophis mcdowelli<br>MacDowell's Sea Snake, Small-headed Sea Snake, [75601] | | Species or species habitat may occur within area | In feature area |
| Hydrophis major as Disteira major<br>Olive-headed Sea Snake [93512] | | Species or species habitat may occur within area | In feature area |
| Hydrophis ornatus<br>Spotted Sea Snake, Ornate Reef Sea Snake [1111] | | Species or species habitat may occur within area | In feature area |
| Hydrophis peronii as Acalyptophis peronii<br>Horned Sea Snake [93509] | | Species or species habitat may occur within area | In feature area |
| Hydrophis platura as Pelamis platurus<br>Yellow-bellied Sea Snake [93746] | | Species or species habitat may occur within area | In feature area |
| Hydrophis stokesii as Astrotia stokesii<br>Stokes' Sea Snake [93510] | | Species or species habitat may occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area | In feature area |

| Whales and Other Cetaceans | | | [ Resource Information ] |
|---|---|---|---|
| Current Scientific Name | Status | Type of Presence | Buffer Status |
| Mammal | | | |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area | In feature area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Delphinus delphis<br>Common Dolphin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area | In feature area |
| Feresa attenuata<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area | In feature area |
| Globicephala macrorhynchus<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area | In feature area |
| Grampus griseus<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area | In feature area |
| Kogia breviceps<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area | In feature area |
| Kogia sima<br>Dwarf Sperm Whale [85043] | | Species or species habitat may occur within area | In feature area |
| Lagenodelphis hosei<br>Fraser's Dolphin, Sarawak Dolphin [41] | | Species or species habitat may occur within area | In buffer area only |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat known to occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Mesoplodon densirostris<br>Blainville's Beaked Whale, Dense-beaked Whale [74] | | Species or species habitat may occur within area | In buffer area only |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In feature area |
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area | In feature area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area | In feature area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area | In feature area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area | In feature area |
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area | In feature area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area | In feature area |
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area | In feature area |
| Tursiops aduncus<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat may occur within area | In feature area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area | In feature area |
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area | In feature area |

## Extra Information

| EPBC Act Referrals | | | | [ Resource Information ] |
|---|---|---|---|---|
| Title of referral | Reference | Referral Outcome | Assessment Status | Buffer Status |
| | | | | |
| Browse to North West Shelf Development, Indian Ocean, WA | 2018/8319 | | Approval | In feature area |
| Deep Water Northwest Shelf 2D Seismic Survey | 2007/3260 | | Completed | In feature area |
| Controlled action | | | | |
| Development of Browse Basin Gas Fields (Upstream) | 2008/4111 | Controlled Action | Completed | In feature area |
| Not controlled action | | | | |
| Huascaran-1 exploration well (WA-292-P) | 2001/539 | Not Controlled Action | Completed | In feature area |
| Manaslu - 1 and Huascaran - 1 Offshore Exploration Wells | 2001/235 | Not Controlled Action | Completed | In feature area |
| WA-295-P Kerr-McGee Exploration Wells | 2001/152 | Not Controlled Action | Completed | In buffer area only |
| Not controlled action (particular manner) | | | | |
| 2D seismic survey within permit WA-291 | 2007/3265 | Not Controlled Action (Particular Manner) | Post-Approval | In buffer area only |
| Offshore Canning Multi Client 2D Marine Seismic Survey | 2010/5393 | Not Controlled Action (Particular Manner) | Post-Approval | In feature area |
| Offshore Fibre Optic Cable Network Construction & Operation, Port Hedland WA to Darwin NT | 2014/7223 | Not Controlled Action (Particular Manner) | Post-Approval | In buffer area only |
| Westralia SPAN Marine Seismic Survey, WA & NT | 2012/6463 | Not Controlled Action | Post-Approval | In buffer area only |

| Title of referral | Reference | Referral Outcome | Assessment Status | Buffer Status |
|---|---|---|---|---|
| Not controlled action (particular manner) | | | | |
| | | (Particular Manner) | | |

## Key Ecological Features [ 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 | Buffer Status |
|---|---|---|
| Ancient coastline at 125 m depth contour | North-west | In feature area |

## Biologically Important Areas [ Resource Information ]

| Scientific Name | Behaviour | Presence | Buffer Status |
|---|---|---|---|
| Seabirds | | | |
| Fregata ariel | | | |
| Lesser Frigatebird [1012] | Breeding | Known to occur | In feature area |
| Phaethon lepturus | | | |
| White-tailed Tropicbird [1014] | Breeding | Known to occur | In buffer area only |
| Sharks | | | |
| Rhincodon typus | | | |
| Whale Shark [66680] | Foraging | Known to occur | In feature area |
| Whales | | | |
| Balaenoptera musculus brevicauda | | | |
| Pygmy Blue Whale [81317] | Migration | Known to occur | In buffer area only |

# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

## 3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions when time permits.

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

# Acknowledgements

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

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

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

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

© Commonwealth of Australia
Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

PMST - Ara OA

# 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. Please see the caveat for interpretation of information provided here.

Report created: 22-May-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

# Summary

## Matters of National Environment 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 (Ramsar | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 1 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 19 |
| Listed Migratory Species: | 34 |

## 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 https://www.dcceew.gov.au/parks-heritage/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 Lands: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 61 |
| Whales and Other Cetaceans: | 25 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |
| Habitat Critical to the Survival of Marine Turtles: | None |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Nationally Important Wetlands: | None |
| EPBC Act Referrals: | 6 |
| Key Ecological Features (Marine): | 1 |
| Biologically Important Areas: | 3 |
| Bioregional Assessments: | None |
| Geological and Bioregional Assessments: | None |

# Details

## Matters of National Environmental Significance

### Commonwealth Marine Area [ Resource Information ]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

| Feature Name | Buffer Status |
|---|---|
| Commonwealth Marine Areas (EPBC Act) | In feature area |

### Listed Threatened Species [ Resource Information ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| BIRD | | | |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area | In feature area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area | In feature area |
| Phaethon rubricauda westralis<br>Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824] | Endangered | Species or species habitat likely to occur within area | In feature area |
| MAMMAL | | | |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Balaenoptera borealis](#)<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Balaenoptera musculus](#)<br>Blue Whale [36] | Endangered | Migration route known to occur within area | In feature area |
| [Balaenoptera physalus](#)<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| REPTILE | | | |
| [Caretta caretta](#)<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Chelonia mydas](#)<br>Green Turtle [1765] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| [Dermochelys coriacea](#)<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Eretmochelys imbricata](#)<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Natator depressus](#)<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| SHARK | | | |
| [Carcharodon carcharias](#)<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Pristis pristis](#)<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Pristis zijsron](#)<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Rhincodon typus](#) | | | |
| Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| [Sphyrna lewini](#) | | | |
| Scalloped Hammerhead [85267] | Conservation Dependent | Species or species habitat likely to occur within area | In feature area |

| Listed Migratory Species | | | [ Resource Information ] |
|---|---|---|---|
| Scientific Name | Threatened Category | Presence Text | Buffer Status |
| Migratory Marine Birds | | | |
| [Anous stolidus](#) | | | |
| Common Noddy [825] | | Species or species habitat may occur within area | In feature area |
| [Calonectris leucomelas](#) | | | |
| Streaked Shearwater [1077] | | Species or species habitat likely to occur within area | In feature area |
| [Fregata ariel](#) | | | |
| Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |
| [Fregata minor](#) | | | |
| Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| [Phaethon lepturus](#) | | | |
| White-tailed Tropicbird [1014] | | Species or species habitat likely to occur within area | In feature area |
| Migratory Marine Species | | | |
| [Anoxypristis cuspidata](#) | | | |
| Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat may occur within area | In feature area |
| [Balaenoptera borealis](#) | | | |
| Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Balaenoptera edeni](#) | | | |
| Bryde's Whale [35] | | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area | In feature area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Carcharhinus longimanus<br>Oceanic Whitetip Shark [84108] | | Species or species habitat may occur within area | In feature area |
| Carcharias taurus<br>Grey Nurse Shark [64469] | | Species or species habitat may occur within area | In feature area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Isurus oxyrinchus<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area | In feature area |
| Isurus paucus<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat known to occur within area | In feature area |
| Mobula alfredi as Manta alfredi<br>Reef Manta Ray, Coastal Manta Ray [90033] | | Species or species habitat likely to occur within area | In feature area |
| Mobula birostris as Manta birostris<br>Giant Manta Ray [90034] | | Species or species habitat likely to occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In feature area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area | In feature area |
| Pristis pristis<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area | In feature area |
| **Migratory Wetlands Species** | | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Calidris acuminata](#)<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Calidris canutus](#)<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Calidris melanotos](#)<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area | In feature area |
| [Numenius madagascariensis](#)<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |

## Other Matters Protected by the EPBC Act

| Listed Marine Species | | | [ Resource Information ] |
|---|---|---|---|
| Scientific Name | Threatened Category | Presence Text | Buffer Status |
| Bird | | | |
| [Actitis hypoleucos](#)<br>Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |
| [Anous stolidus](#)<br>Common Noddy [825] | | Species or species habitat may occur within area | In feature area |
| [Calidris acuminata](#)<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Calidris canutus](#)<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area overfly marine area | In feature area |
| [Calidris melanotos](#)<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area overfly marine area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area | In feature area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area | In feature area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Species or species habitat likely to occur within area | In feature area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area | In feature area |
| Fish | | | |
| Bhanotia fasciolata<br>Corrugated Pipefish, Barbed Pipefish [66188] | | Species or species habitat may occur within area | In feature area |
| Campichthys tricarinatus<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area | In feature area |
| Choeroichthys brachysoma<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area | In feature area |
| Choeroichthys suillus<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Corythoichthys amplexus](#)<br>Fijian Banded Pipefish, Brown-banded Pipefish [66199] | | Species or species habitat may occur within area | In feature area |
| [Corythoichthys flavofasciatus](#)<br>Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200] | | Species or species habitat may occur within area | In feature area |
| [Corythoichthys intestinalis](#)<br>Australian Messmate Pipefish, Banded Pipefish [66202] | | Species or species habitat may occur within area | In feature area |
| [Corythoichthys schultzi](#)<br>Schultz's Pipefish [66205] | | Species or species habitat may occur within area | In feature area |
| [Cosmocampus banneri](#)<br>Roughridge Pipefish [66206] | | Species or species habitat may occur within area | In feature area |
| [Doryrhamphus dactyliophorus](#)<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area | In feature area |
| [Doryrhamphus excisus](#)<br>Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211] | | Species or species habitat may occur within area | In feature area |
| [Doryrhamphus janssi](#)<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area | In feature area |
| [Filicampus tigris](#)<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area | In feature area |
| [Halicampus brocki](#)<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area | In feature area |
| [Halicampus dunckeri](#)<br>Red-hair Pipefish, Duncker's Pipefish [66220] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area | In feature area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area | In feature area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area | In feature area |
| Hippichthys penicillus<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area | In feature area |
| Hippocampus angustus<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area | In feature area |
| Hippocampus histrix<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area | In feature area |
| Hippocampus kuda<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area | In feature area |
| Hippocampus planifrons<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area | In feature area |
| Hippocampus spinosissimus<br>Hedgehog Seahorse [66239] | | Species or species habitat may occur within area | In feature area |
| Micrognathus micronotopterus<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area | In feature area |
| Solegnathus hardwickii<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Solegnathus lettiensis](#)<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area | In feature area |
| [Solenostomus cyanopterus](#)<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area | In feature area |
| [Syngnathoides biaculeatus](#)<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area | In feature area |
| [Trachyrhamphus bicoarctatus](#)<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area | In feature area |
| [Trachyrhamphus longirostris](#)<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area | In feature area |
| **Reptile** | | | |
| [Aipysurus duboisii](#)<br>Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116] | | Species or species habitat may occur within area | In feature area |
| [Aipysurus laevis](#)<br>Olive Sea Snake, Olive-brown Sea Snake [1120] | | Species or species habitat may occur within area | In feature area |
| [Aipysurus mosaicus as Aipysurus eydouxii](#)<br>Mosaic Sea Snake [87261] | | Species or species habitat may occur within area | In feature area |
| [Caretta caretta](#)<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Chelonia mydas](#)<br>Green Turtle [1765] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| [Dermochelys coriacea](#)<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Ephalophis greyae as Ephalophis greyi<br>Mangrove Sea Snake [93738] | | Species or species habitat may occur within area | In feature area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Hydrophis czeblukovi<br>Fine-spined Sea Snake [59233] | | Species or species habitat may occur within area | In feature area |
| Hydrophis elegans<br>Elegant Sea Snake, Bar-bellied Sea Snake [1104] | | Species or species habitat may occur within area | In feature area |
| Hydrophis kingii as Disteira kingii<br>Spectacled Sea Snake [93511] | | Species or species habitat may occur within area | In feature area |
| Hydrophis macdowelli as Hydrophis mcdowelli<br>MacDowell's Sea Snake, Small-headed Sea Snake, [75601] | | Species or species habitat may occur within area | In feature area |
| Hydrophis major as Disteira major<br>Olive-headed Sea Snake [93512] | | Species or species habitat may occur within area | In feature area |
| Hydrophis ornatus<br>Spotted Sea Snake, Ornate Reef Sea Snake [1111] | | Species or species habitat may occur within area | In feature area |
| Hydrophis peronii as Acalyptophis peronii<br>Horned Sea Snake [93509] | | Species or species habitat may occur within area | In feature area |
| Hydrophis platura as Pelamis platurus<br>Yellow-bellied Sea Snake [93746] | | Species or species habitat may occur within area | In feature area |
| Hydrophis stokesii as Astrotia stokesii<br>Stokes' Sea Snake [93510] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area | In feature area |

## Whales and Other Cetaceans [ Resource Information ]

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Mammal | | | |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area | In feature area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Delphinus delphis<br>Common Dolphin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area | In feature area |
| Feresa attenuata<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area | In feature area |
| Globicephala macrorhynchus<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area | In feature area |
| Grampus griseus<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area | In feature area |
| Kogia breviceps<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Kogia sima<br>Dwarf Sperm Whale [85043] | | Species or species habitat may occur within area | In feature area |
| Lagenodelphis hosei<br>Fraser's Dolphin, Sarawak Dolphin [41] | | Species or species habitat may occur within area | In feature area |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat known to occur within area | In feature area |
| Mesoplodon densirostris<br>Blainville's Beaked Whale, Dense-beaked Whale [74] | | Species or species habitat may occur within area | In feature area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In feature area |
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area | In feature area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area | In feature area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area | In feature area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area | In feature area |
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area | In feature area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area | In feature area |
| Tursiops aduncus<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat may occur within area | In feature area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area | In feature area |
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area | In feature area |
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area | In feature area |

## Extra Information

| EPBC Act Referrals | | | | [ Resource Information ] |
|---|---|---|---|---|
| Title of referral | Reference | Referral Outcome | Assessment Status | Buffer Status |
| | | | | |
| Browse to North West Shelf Development, Indian Ocean, WA | 2018/8319 | | Approval | In feature area |
| Deep Water Northwest Shelf 2D Seismic Survey | 2007/3260 | | Completed | In feature area |
| Controlled action | | | | |
| Development of Browse Basin Gas Fields (Upstream) | 2008/4111 | Controlled Action | Completed | In feature area |
| Not controlled action (particular manner) | | | | |
| Offshore Canning Multi Client 2D Marine Seismic Survey | 2010/5393 | Not Controlled Action (Particular Manner) | Post-Approval | In feature area |
| Offshore Fibre Optic Cable Network Construction & Operation, Port Hedland WA to Darwin NT | 2014/7223 | Not Controlled Action (Particular Manner) | Post-Approval | In buffer area only |
| Westralia SPAN Marine Seismic Survey, WA & NT | 2012/6463 | Not Controlled Action | Post-Approval | In feature area |

| Title of referral | Reference | Referral Outcome | Assessment Status | Buffer Status |
|---|---|---|---|---|
| Not controlled action (particular manner) | | | | |
| | | (Particular Manner) | | |

## Key Ecological Features [ 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 | Buffer Status |
|---|---|---|
| Ancient coastline at 125 m depth contour | North-west | In feature area |

## Biologically Important Areas [ Resource Information ]

| Scientific Name | Behaviour | Presence | Buffer Status |
|---|---|---|---|
| Seabirds | | | |
| Phaethon lepturus | | | |
| White-tailed Tropicbird [1014] | Breeding | Known to occur | In feature area |
| Sharks | | | |
| Rhincodon typus | | | |
| Whale Shark [66680] | Foraging | Known to occur | In feature area |
| Whales | | | |
| Balaenoptera musculus brevicauda | | | |
| Pygmy Blue Whale [81317] | Migration | Known to occur | In buffer area only |

# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

## 3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions when time permits.

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

# Acknowledgements

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

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

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

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

© Commonwealth of Australia
Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

# PMST - Curie OA

# 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. Please see the caveat for interpretation of information provided here.

Report created: 23-Apr-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

# Summary

## Matters of National Environment 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 (Ramsar | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 1 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 19 |
| Listed Migratory Species: | 34 |

## 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 https://www.dcceew.gov.au/parks-heritage/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 Lands: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 58 |
| Whales and Other Cetaceans: | 25 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |
| Habitat Critical to the Survival of Marine Turtles: | None |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Nationally Important Wetlands: | None |
| EPBC Act Referrals: | 10 |
| Key Ecological Features (Marine): | 1 |
| Biologically Important Areas: | 4 |
| Bioregional Assessments: | None |
| Geological and Bioregional Assessments: | None |

# Details

## Matters of National Environmental Significance

### Commonwealth Marine Area [ Resource Information ]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

| Feature Name | Buffer Status |
|---|---|
| Commonwealth Marine Areas (EPBC Act) | In feature area |

### Listed Threatened Species [ Resource Information ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| BIRD | | | |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area | In feature area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area | In feature area |
| Phaethon rubricauda westralis<br>Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824] | Endangered | Species or species habitat likely to occur within area | In feature area |
| MAMMAL | | | |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Balaenoptera borealis](#)<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Balaenoptera musculus](#)<br>Blue Whale [36] | Endangered | Migration route known to occur within area | In feature area |
| [Balaenoptera physalus](#)<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| REPTILE | | | |
| [Caretta caretta](#)<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Chelonia mydas](#)<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Dermochelys coriacea](#)<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Eretmochelys imbricata](#)<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Natator depressus](#)<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| SHARK | | | |
| [Carcharodon carcharias](#)<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Pristis pristis](#)<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Pristis zijsron](#)<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Rhincodon typus | | | |
| Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Sphyrna lewini | | | |
| Scalloped Hammerhead [85267] | Conservation Dependent | Species or species habitat known to occur within area | In feature area |

## Listed Migratory Species [ Resource Information ]

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Migratory Marine Birds | | | |
| Anous stolidus | | | |
| Common Noddy [825] | | Species or species habitat may occur within area | In feature area |
| Calonectris leucomelas | | | |
| Streaked Shearwater [1077] | | Species or species habitat likely to occur within area | In feature area |
| Fregata ariel | | | |
| Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |
| Fregata minor | | | |
| Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| Phaethon lepturus | | | |
| White-tailed Tropicbird [1014] | | Species or species habitat likely to occur within area | In feature area |
| Migratory Marine Species | | | |
| Anoxypristis cuspidata | | | |
| Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat known to occur within area | In feature area |
| Balaenoptera borealis | | | |
| Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera edeni | | | |
| Bryde's Whale [35] | | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Balaenoptera musculus](#)<br>Blue Whale [36] | Endangered | Migration route known to occur within area | In feature area |
| [Balaenoptera physalus](#)<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Carcharhinus longimanus](#)<br>Oceanic Whitetip Shark [84108] | | Species or species habitat likely to occur within area | In feature area |
| [Carcharias taurus](#)<br>Grey Nurse Shark [64469] | | Species or species habitat may occur within area | In feature area |
| [Carcharodon carcharias](#)<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Caretta caretta](#)<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Chelonia mydas](#)<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Dermochelys coriacea](#)<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Eretmochelys imbricata](#)<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Isurus oxyrinchus](#)<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area | In feature area |
| [Isurus paucus](#)<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat known to occur within area | In feature area |
| Mobula alfredi as Manta alfredi<br>Reef Manta Ray, Coastal Manta Ray [90033] | | Species or species habitat likely to occur within area | In feature area |
| Mobula birostris as Manta birostris<br>Giant Manta Ray [90034] | | Species or species habitat likely to occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In feature area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area | In feature area |
| Pristis pristis<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area | In feature area |
| **Migratory Wetlands Species** | | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Calidris acuminata](#)<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Calidris canutus](#)<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Calidris melanotos](#)<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area | In feature area |
| [Numenius madagascariensis](#)<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |

## Other Matters Protected by the EPBC Act

| Listed Marine Species | | | [ Resource Information ] |
|---|---|---|---|
| Scientific Name | Threatened Category | Presence Text | Buffer Status |
| Bird | | | |
| [Actitis hypoleucos](#)<br>Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |
| [Anous stolidus](#)<br>Common Noddy [825] | | Species or species habitat may occur within area | In feature area |
| [Calidris acuminata](#)<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Calidris canutus](#)<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area overfly marine area | In feature area |
| [Calidris melanotos](#)<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area overfly marine area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area | In feature area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area | In feature area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Species or species habitat likely to occur within area | In feature area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area | In feature area |
| Fish | | | |
| Campichthys tricarinatus<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area | In feature area |
| Choeroichthys brachysoma<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area | In feature area |
| Choeroichthys suillus<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area | In feature area |
| Corythoichthys flavofasciatus<br>Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Cosmocampus banneri<br>Roughridge Pipefish [66206] | | Species or species habitat may occur within area | In feature area |
| Doryrhamphus dactyliophorus<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area | In feature area |
| Doryrhamphus excisus<br>Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211] | | Species or species habitat may occur within area | In feature area |
| Doryrhamphus janssi<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area | In feature area |
| Filicampus tigris<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area | In feature area |
| Halicampus brocki<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area | In feature area |
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area | In feature area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area | In feature area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area | In feature area |
| Hippichthys penicillus<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area | In feature area |
| Hippocampus angustus<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Hippocampus histrix<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area | In feature area |
| Hippocampus kuda<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area | In feature area |
| Hippocampus planifrons<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area | In feature area |
| Hippocampus spinosissimus<br>Hedgehog Seahorse [66239] | | Species or species habitat may occur within area | In feature area |
| Micrognathus micronotopterus<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area | In feature area |
| Solegnathus hardwickii<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area | In feature area |
| Solegnathus lettiensis<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area | In feature area |
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area | In feature area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area | In feature area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area | In feature area |
| Trachyrhamphus longirostris<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area | In feature area |
| Reptile | | | |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Aipysurus duboisii<br>Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116] | | Species or species habitat may occur within area | In feature area |
| Aipysurus laevis<br>Olive Sea Snake, Olive-brown Sea Snake [1120] | | Species or species habitat may occur within area | In feature area |
| Aipysurus mosaicus as Aipysurus eydouxii<br>Mosaic Sea Snake [87261] | | Species or species habitat may occur within area | In feature area |
| Aipysurus tenuis<br>Brown-lined Sea Snake, Mjoberg's Sea Snake [1121] | | Species or species habitat may occur within area | In buffer area only |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Ephalophis greyae as Ephalophis greyi<br>Mangrove Sea Snake [93738] | | Species or species habitat may occur within area | In feature area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Hydrelaps darwiniensis<br>Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100] | | Species or species habitat may occur within area | In buffer area only |
| Hydrophis czeblukovi<br>Fine-spined Sea Snake [59233] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Hydrophis elegans<br>Elegant Sea Snake, Bar-bellied Sea Snake [1104] | | Species or species habitat may occur within area | In feature area |
| Hydrophis kingii as Disteira kingii<br>Spectacled Sea Snake [93511] | | Species or species habitat may occur within area | In feature area |
| Hydrophis macdowelli as Hydrophis mcdowelli<br>MacDowell's Sea Snake, Small-headed Sea Snake, [75601] | | Species or species habitat may occur within area | In feature area |
| Hydrophis major as Disteira major<br>Olive-headed Sea Snake [93512] | | Species or species habitat may occur within area | In feature area |
| Hydrophis ornatus<br>Spotted Sea Snake, Ornate Reef Sea Snake [1111] | | Species or species habitat may occur within area | In feature area |
| Hydrophis peronii as Acalyptophis peronii<br>Horned Sea Snake [93509] | | Species or species habitat may occur within area | In feature area |
| Hydrophis platura as Pelamis platurus<br>Yellow-bellied Sea Snake [93746] | | Species or species habitat may occur within area | In feature area |
| Hydrophis stokesii as Astrotia stokesii<br>Stokes' Sea Snake [93510] | | Species or species habitat may occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Species or species habitat likely to occur within area | In feature area |

| Whales and Other Cetaceans | | | [ Resource Information ] |
|---|---|---|---|
| Current Scientific Name | Status | Type of Presence | Buffer Status |
| Mammal | | | |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area | In feature area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Delphinus delphis<br>Common Dolphin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area | In feature area |
| Feresa attenuata<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area | In feature area |
| Globicephala macrorhynchus<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area | In feature area |
| Grampus griseus<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area | In feature area |
| Kogia breviceps<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area | In feature area |
| Kogia sima<br>Dwarf Sperm Whale [85043] | | Species or species habitat may occur within area | In feature area |
| Lagenodelphis hosei<br>Fraser's Dolphin, Sarawak Dolphin [41] | | Species or species habitat may occur within area | In buffer area only |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat known to occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Mesoplodon densirostris<br>Blainville's Beaked Whale, Dense-beaked Whale [74] | | Species or species habitat may occur within area | In buffer area only |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In feature area |
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area | In feature area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area | In feature area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area | In feature area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area | In feature area |
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area | In feature area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area | In feature area |
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area | In feature area |
| Tursiops aduncus<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat may occur within area | In feature area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat may occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area | In feature area |
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area | In feature area |

## Extra Information

| EPBC Act Referrals | | | | [ Resource Information ] |
|---|---|---|---|---|
| Title of referral | Reference | Referral Outcome | Assessment Status | Buffer Status |
| | | | | |
| Browse to North West Shelf Development, Indian Ocean, WA | 2018/8319 | | Approval | In feature area |
| Deep Water Northwest Shelf 2D Seismic Survey | 2007/3260 | | Completed | In feature area |
| Controlled action | | | | |
| Development of Browse Basin Gas Fields (Upstream) | 2008/4111 | Controlled Action | Completed | In feature area |
| Not controlled action | | | | |
| Huascaran-1 exploration well (WA-292-P) | 2001/539 | Not Controlled Action | Completed | In feature area |
| Manaslu - 1 and Huascaran - 1 Offshore Exploration Wells | 2001/235 | Not Controlled Action | Completed | In feature area |
| WA-295-P Kerr-McGee Exploration Wells | 2001/152 | Not Controlled Action | Completed | In buffer area only |
| Not controlled action (particular manner) | | | | |
| 2D seismic survey within permit WA-291 | 2007/3265 | Not Controlled Action (Particular Manner) | Post-Approval | In buffer area only |
| Offshore Canning Multi Client 2D Marine Seismic Survey | 2010/5393 | Not Controlled Action (Particular Manner) | Post-Approval | In feature area |
| Offshore Fibre Optic Cable Network Construction & Operation, Port Hedland WA to Darwin NT | 2014/7223 | Not Controlled Action (Particular Manner) | Post-Approval | In buffer area only |
| Westralia SPAN Marine Seismic Survey, WA & NT | 2012/6463 | Not Controlled Action | Post-Approval | In buffer area only |

| Title of referral | Reference | Referral Outcome | Assessment Status | Buffer Status |
|---|---|---|---|---|
| Not controlled action (particular manner) | | | | |
| | | (Particular Manner) | | |

## Key Ecological Features [ 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 | Buffer Status |
|---|---|---|
| Ancient coastline at 125 m depth contour | North-west | In feature area |

## Biologically Important Areas [ Resource Information ]

| Scientific Name | Behaviour | Presence | Buffer Status |
|---|---|---|---|
| Seabirds | | | |
| Fregata ariel | | | |
| Lesser Frigatebird [1012] | Breeding | Known to occur | In feature area |
| Phaethon lepturus | | | |
| White-tailed Tropicbird [1014] | Breeding | Known to occur | In buffer area only |
| Sharks | | | |
| Rhincodon typus | | | |
| Whale Shark [66680] | Foraging | Known to occur | In feature area |
| Whales | | | |
| Balaenoptera musculus brevicauda | | | |
| Pygmy Blue Whale [81317] | Migration | Known to occur | In buffer area only |

# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

## 3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions when time permits.

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

# Acknowledgements

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

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

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

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

© Commonwealth of Australia
Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

# PMST - Wallace OA

# 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. Please see the caveat for interpretation of information provided here.

Report created: 23-Apr-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

# Summary

## Matters of National Environment 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 (Ramsar | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 2 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 24 |
| Listed Migratory Species: | 42 |

## 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 https://www.dcceew.gov.au/parks-heritage/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 Lands: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 75 |
| Whales and Other Cetaceans: | 27 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | 1 |
| Habitat Critical to the Survival of Marine Turtles: | None |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | None |
| Nationally Important Wetlands: | None |
| EPBC Act Referrals: | 6 |
| Key Ecological Features (Marine): | 1 |
| Biologically Important Areas: | 8 |
| Bioregional Assessments: | None |
| Geological and Bioregional Assessments: | None |

# Details

## Matters of National Environmental Significance

### Commonwealth Marine Area [ Resource Information ]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

| Feature Name | Buffer Status |
|---|---|
| Commonwealth Marine Areas (EPBC Act) | In buffer area only |
| Commonwealth Marine Areas (EPBC Act) | In feature area |

### Listed Threatened Species [ Resource Information ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| BIRD | | | |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area | In buffer area only |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Phaethon rubricauda westralis](#)<br>Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824] | Endangered | Species or species habitat likely to occur within area | In feature area |
| MAMMAL | | | |
| [Balaenoptera borealis](#)<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Balaenoptera musculus](#)<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Balaenoptera physalus](#)<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Orcaella heinsohni](#)<br>Australian Snubfin Dolphin [81322] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Sousa sahulensis](#)<br>Australian Humpback Dolphin [87942] | Vulnerable | Species or species habitat may occur within area | In feature area |
| REPTILE | | | |
| [Aipysurus apraefrontalis](#)<br>Short-nosed Sea Snake, Short-nosed Seasnake [1115] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| [Caretta caretta](#)<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area | In feature area |
| [Chelonia mydas](#)<br>Green Turtle [1765] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| [Dermochelys coriacea](#)<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Eretmochelys imbricata](#)<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Natator depressus](#) | | | |
| Flatback Turtle [59257] | Vulnerable | Congregation or aggregation known to occur within area | In feature area |
| SHARK | | | |
| [Carcharodon carcharias](#) | | | |
| White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Pristis clavata](#) | | | |
| Dwarf Sawfish, Queensland Sawfish [68447] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| [Pristis pristis](#) | | | |
| Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Pristis zijsron](#) | | | |
| Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| [Rhincodon typus](#) | | | |
| Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| [Sphyrna lewini](#) | | | |
| Scalloped Hammerhead [85267] | Conservation Dependent | Species or species habitat known to occur within area | In feature area |

| Listed Migratory Species | | [ Resource Information ] | |
|---|---|---|---|
| Scientific Name | Threatened Category | Presence Text | Buffer Status |
| Migratory Marine Birds | | | |
| [Anous stolidus](#) | | | |
| Common Noddy [825] | | Species or species habitat may occur within area | In feature area |
| [Calonectris leucomelas](#) | | | |
| Streaked Shearwater [1077] | | Species or species habitat likely to occur within area | In feature area |
| [Fregata ariel](#) | | | |
| Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Species or species habitat likely to occur within area | In feature area |
| Sterna dougallii<br>Roseate Tern [817] | | Breeding likely to occur within area | In buffer area only |
| Sula leucogaster<br>Brown Booby [1022] | | Breeding known to occur within area | In feature area |
| **Migratory Marine Species** | | | |
| Anoxypristis cuspidata<br>Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area | In feature area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Carcharhinus longimanus<br>Oceanic Whitetip Shark [84108] | | Species or species habitat may occur within area | In feature area |
| Carcharias taurus<br>Grey Nurse Shark [64469] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area | In feature area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Crocodylus porosus<br>Salt-water Crocodile, Estuarine Crocodile [1774] | | Species or species habitat may occur within area | In feature area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Dugong dugon<br>Dugong [28] | | Species or species habitat may occur within area | In feature area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Isurus oxyrinchus<br>Shortfin Mako, Mako Shark [79073] | | Species or species habitat likely to occur within area | In feature area |
| Isurus paucus<br>Longfin Mako [82947] | | Species or species habitat likely to occur within area | In feature area |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Breeding known to occur within area | In feature area |
| Mobula alfredi as Manta alfredi<br>Reef Manta Ray, Coastal Manta Ray [90033] | | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Mobula birostris as Manta birostris<br>Giant Manta Ray [90034] | | Species or species habitat likely to occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Congregation or aggregation known to occur within area | In feature area |
| Orcaella heinsohni<br>Australian Snubfin Dolphin [81322] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In feature area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area | In feature area |
| Pristis clavata<br>Dwarf Sawfish, Queensland Sawfish [68447] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Pristis pristis<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Sousa sahulensis as Sousa chinensis<br>Australian Humpback Dolphin [87942] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat likely to occur within area | In feature area |

| Migratory Wetlands Species |
|---|

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area | In feature area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |

## Other Matters Protected by the EPBC Act

| Listed Marine Species | | | [ Resource Information ] |
|---|---|---|---|
| Scientific Name | Threatened Category | Presence Text | Buffer Status |
| Bird | | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area | In feature area |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat may occur within area | In feature area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Calidris canutus](#)<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat may occur within area overfly marine area | In feature area |
| [Calidris ferruginea](#)<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area overfly marine area | In feature area |
| [Calidris melanotos](#)<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area overfly marine area | In feature area |
| [Calonectris leucomelas](#)<br>Streaked Shearwater [1077] | | Species or species habitat likely to occur within area | In feature area |
| [Fregata ariel](#)<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |
| [Fregata minor](#)<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| [Numenius madagascariensis](#)<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| [Papasula abbotti](#)<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area | In buffer area only |
| [Phaethon lepturus](#)<br>White-tailed Tropicbird [1014] | | Species or species habitat likely to occur within area | In feature area |
| [Phaethon lepturus fulvus](#)<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Species or species habitat may occur within area | In feature area |
| [Sterna dougallii](#)<br>Roseate Tern [817] | | Breeding likely to occur within area | In buffer area only |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Sula leucogaster](#)<br>Brown Booby [1022] | | Breeding known to occur within area | In feature area |
| [Thalasseus bengalensis as Sterna bengalensis](#)<br>Lesser Crested Tern [66546] | | Breeding known to occur within area | In buffer area only |
| **Fish** | | | |
| [Acentronura larsonae](#)<br>Helen's Pygmy Pipehorse [66186] | | Species or species habitat may occur within area | In feature area |
| [Bulbonaricus brauni](#)<br>Braun's Pughead Pipefish, Pug-headed Pipefish [66189] | | Species or species habitat may occur within area | In feature area |
| [Campichthys tricarinatus](#)<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area | In feature area |
| [Choeroichthys brachysoma](#)<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area | In feature area |
| [Choeroichthys latispinosus](#)<br>Muiron Island Pipefish [66196] | | Species or species habitat may occur within area | In feature area |
| [Choeroichthys suillus](#)<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area | In feature area |
| [Corythoichthys flavofasciatus](#)<br>Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200] | | Species or species habitat may occur within area | In feature area |
| [Cosmocampus banneri](#)<br>Roughridge Pipefish [66206] | | Species or species habitat may occur within area | In feature area |
| [Doryrhamphus dactyliophorus](#)<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Doryrhamphus excisus<br>Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211] | | Species or species habitat may occur within area | In feature area |
| Doryrhamphus janssi<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area | In feature area |
| Doryrhamphus multiannulatus<br>Many-banded Pipefish [66717] | | Species or species habitat may occur within area | In feature area |
| Doryrhamphus negrosensis<br>Flagtail Pipefish, Masthead Island Pipefish [66213] | | Species or species habitat may occur within area | In feature area |
| Festucalex scalaris<br>Ladder Pipefish [66216] | | Species or species habitat may occur within area | In feature area |
| Filicampus tigris<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area | In feature area |
| Halicampus brocki<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area | In feature area |
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area | In feature area |
| Halicampus nitidus<br>Glittering Pipefish [66224] | | Species or species habitat may occur within area | In feature area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area | In feature area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Hippichthys penicillus](#)<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area | In feature area |
| [Hippocampus angustus](#)<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area | In feature area |
| [Hippocampus histrix](#)<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area | In feature area |
| [Hippocampus kuda](#)<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area | In feature area |
| [Hippocampus planifrons](#)<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area | In feature area |
| [Hippocampus spinosissimus](#)<br>Hedgehog Seahorse [66239] | | Species or species habitat may occur within area | In feature area |
| [Hippocampus trimaculatus](#)<br>Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720] | | Species or species habitat may occur within area | In feature area |
| [Micrognathus micronotopterus](#)<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area | In feature area |
| [Phoxocampus belcheri](#)<br>Black Rock Pipefish [66719] | | Species or species habitat may occur within area | In feature area |
| [Solegnathus hardwickii](#)<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area | In feature area |
| [Solegnathus lettiensis](#)<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area | In feature area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area | In feature area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area | In feature area |
| Trachyrhamphus longirostris<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area | In feature area |
| **Mammal** | | | |
| Dugong dugon<br>Dugong [28] | | Species or species habitat may occur within area | In feature area |
| **Reptile** | | | |
| Aipysurus apraefrontalis<br>Short-nosed Sea Snake, Short-nosed Seasnake [1115] | Critically Endangered | Species or species habitat may occur within area | In feature area |
| Aipysurus duboisii<br>Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116] | | Species or species habitat may occur within area | In feature area |
| Aipysurus laevis<br>Olive Sea Snake, Olive-brown Sea Snake [1120] | | Species or species habitat may occur within area | In feature area |
| Aipysurus mosaicus as Aipysurus eydouxii<br>Mosaic Sea Snake [87261] | | Species or species habitat may occur within area | In feature area |
| Aipysurus tenuis<br>Brown-lined Sea Snake, Mjoberg's Sea Snake [1121] | | Species or species habitat may occur within area | In feature area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Crocodylus porosus<br>Salt-water Crocodile, Estuarine Crocodile [1774] | | Species or species habitat may occur within area | In feature area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Emydocephalus annulatus<br>Eastern Turtle-headed Sea Snake [1125] | | Species or species habitat may occur within area | In buffer area only |
| Ephalophis greyae as Ephalophis greyi<br>Mangrove Sea Snake [93738] | | Species or species habitat may occur within area | In feature area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Hydrelaps darwiniensis<br>Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100] | | Species or species habitat may occur within area | In feature area |
| Hydrophis czeblukovi<br>Fine-spined Sea Snake [59233] | | Species or species habitat may occur within area | In feature area |
| Hydrophis elegans<br>Elegant Sea Snake, Bar-bellied Sea Snake [1104] | | Species or species habitat may occur within area | In feature area |
| Hydrophis kingii as Disteira kingii<br>Spectacled Sea Snake [93511] | | Species or species habitat may occur within area | In feature area |
| Hydrophis macdowelli as Hydrophis mcdowelli<br>MacDowell's Sea Snake, Small-headed Sea Snake, [75601] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Hydrophis major as Disteira major<br>Olive-headed Sea Snake [93512] | | Species or species habitat may occur within area | In feature area |
| Hydrophis ornatus<br>Spotted Sea Snake, Ornate Reef Sea Snake [1111] | | Species or species habitat may occur within area | In feature area |
| Hydrophis peronii as Acalyptophis peronii<br>Horned Sea Snake [93509] | | Species or species habitat may occur within area | In feature area |
| Hydrophis platura as Pelamis platurus<br>Yellow-bellied Sea Snake [93746] | | Species or species habitat may occur within area | In feature area |
| Hydrophis stokesii as Astrotia stokesii<br>Stokes' Sea Snake [93510] | | Species or species habitat may occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Congregation or aggregation known to occur within area | In feature area |

| Whales and Other Cetaceans | | | [ Resource Information ] |
|---|---|---|---|
| Current Scientific Name | Status | Type of Presence | Buffer Status |
| Mammal | | | |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area | In feature area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Species or species habitat likely to occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
| --- | --- | --- | --- |
| Delphinus delphis<br>Common Dolphin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area | In feature area |
| Feresa attenuata<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area | In feature area |
| Globicephala macrorhynchus<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area | In feature area |
| Grampus griseus<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area | In feature area |
| Kogia breviceps<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area | In feature area |
| Kogia sima<br>Dwarf Sperm Whale [85043] | | Species or species habitat may occur within area | In feature area |
| Lagenodelphis hosei<br>Fraser's Dolphin, Sarawak Dolphin [41] | | Species or species habitat may occur within area | In feature area |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Breeding known to occur within area | In feature area |
| Mesoplodon densirostris<br>Blainville's Beaked Whale, Dense-beaked Whale [74] | | Species or species habitat may occur within area | In feature area |
| Orcaella heinsohni<br>Australian Snubfin Dolphin [81322] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area | In feature area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area | In feature area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area | In feature area |
| Sousa sahulensis<br>Australian Humpback Dolphin [87942] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area | In feature area |
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area | In feature area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area | In feature area |
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area | In feature area |
| Tursiops aduncus<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat likely to occur within area | In feature area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat likely to occur within area | In feature area |
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
|---|---|---|---|
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area | In feature area |

## Australian Marine Parks [ Resource Information ]

| Park Name | Zone & IUCN Categories | Buffer Status |
|---|---|---|
| Eighty Mile Beach | Multiple Use Zone (IUCN VI) | In buffer area only |

## Extra Information

### EPBC Act Referrals [ Resource Information ]

| Title of referral | Reference | Referral Outcome | Assessment Status | Buffer Status |
|---|---|---|---|---|
| Deep Water Northwest Shelf 2D Seismic Survey | 2007/3260 | | Completed | In feature area |
| Not controlled action (particular manner) | | | | |
| 2D seismic survey within permit WA-291 | 2007/3265 | Not Controlled Action (Particular Manner) | Post-Approval | In feature area |
| Offshore Canning Multi Client 2D Marine Seismic Survey | 2010/5393 | Not Controlled Action (Particular Manner) | Post-Approval | In feature area |
| Offshore Fibre Optic Cable Network Construction & Operation, Port Hedland WA to Darwin NT | 2014/7223 | Not Controlled Action (Particular Manner) | Post-Approval | In feature area |
| Phoenix 3D Seismic Survey, Bedout Sub-Basin | 2010/5360 | Not Controlled Action (Particular Manner) | Post-Approval | In buffer area only |
| Westralia SPAN Marine Seismic Survey, WA & NT | 2012/6463 | Not Controlled Action (Particular Manner) | Post-Approval | In feature area |

## Key Ecological Features [ 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 | Buffer Status |
|---|---|---|

| Name | Region | Buffer Status |
|---|---|---|
| Ancient coastline at 125 m depth contour | North-west | In feature area |

## Biologically Important Areas

[ Resource Information ]

| Scientific Name | Behaviour | Presence | Buffer Status |
|---|---|---|---|
| **Marine Turtles** | | | |
| Natator depressus<br>Flatback Turtle [59257] | Internesting buffer | Known to occur | In feature area |
| **Seabirds** | | | |
| Ardenna tenuirostris<br>Short-tailed Shearwater [84292] | Breeding | Known to occur | In feature area |
| Fregata ariel<br>Lesser Frigatebird [1012] | Breeding | Known to occur | In feature area |
| Sterna dougallii<br>Roseate Tern [817] | Breeding | Known to occur | In buffer area only |
| Sula leucogaster<br>Brown Booby [1022] | Breeding | Known to occur | In feature area |
| Thalasseus bengalensis<br>Lesser Crested Tern [66546] | Breeding | Known to occur | In buffer area only |
| **Sharks** | | | |
| Rhincodon typus<br>Whale Shark [66680] | Foraging | Known to occur | In feature area |
| **Whales** | | | |
| Megaptera novaeangliae<br>Humpback Whale [38] | Migration (north and south) | Known to occur | In feature area |

# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

## 3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions when time permits.

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

# Acknowledgements

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

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

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

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

© Commonwealth of Australia
Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

PMST - EMBA (Socio-economic EMBA used conduct searches)

# 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. Please see the caveat for interpretation of information provided here.

Report created: 19-May-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

# Summary

## Matters of National Environment 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: | 2 |
| National Heritage Places: | 3 |
| Wetlands of International Importance (Ramsar | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | 8 |
| Listed Threatened Ecological Communities: | None |
| Listed Threatened Species: | 72 |
| Listed Migratory Species: | 76 |

## 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 https://www.dcceew.gov.au/parks-heritage/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 Lands: | 49 |
| Commonwealth Heritage Places: | 4 |
| Listed Marine Species: | 133 |
| Whales and Other Cetaceans: | 33 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | 20 |
| Habitat Critical to the Survival of Marine Turtles: | 4 |

## Extra Information

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

| | |
|---|---|
| State and Territory Reserves: | 47 |
| Regional Forest Agreements: | None |
| Nationally Important Wetlands: | 5 |
| EPBC Act Referrals: | 293 |
| Key Ecological Features (Marine): | 10 |
| Biologically Important Areas: | 61 |
| Bioregional Assessments: | None |
| Geological and Bioregional Assessments: | None |

# Details

## Matters of National Environmental Significance

| World Heritage Properties | | [ Resource Information ] |
|---|---|---|
| Name | State | Legal Status |
| Shark Bay, Western Australia | WA | Declared property |
| The Ningaloo Coast | WA | Declared property |

| National Heritage Places | | [ Resource Information ] |
|---|---|---|
| Name | State | Legal Status |
| Indigenous | | |
| Dampier Archipelago (including Burrup Peninsula) | WA | Listed place |
| Natural | | |
| Shark Bay, Western Australia | WA | Listed place |
| 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 a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

| Feature Name |
|---|
| Commonwealth Marine Areas (EPBC Act) |
| Commonwealth Marine Areas (EPBC Act) |
| Commonwealth Marine Areas (EPBC Act) |
| Commonwealth Marine Areas (EPBC Act) |
| Commonwealth Marine Areas (EPBC Act) |
| Commonwealth Marine Areas (EPBC Act) |
| Commonwealth Marine Areas (EPBC Act) |
| Commonwealth Marine Areas (EPBC Act) |
| Commonwealth Marine Areas (EPBC Act) |

**Listed Threatened Species** [ Resource Information ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| BIRD | | |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Anous tenuirostris melanops<br>Australian Lesser Noddy [26000] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Aphelocephala leucopsis<br>Southern Whiteface [529] | Vulnerable | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat known to occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat known to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat known to occur within area |
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Species or species habitat known to occur within area |
| Diomedea amsterdamensis<br>Amsterdam Albatross [64405] | Endangered | Species or species habitat likely to occur within area |
| Diomedea exulans<br>Wandering Albatross [89223] | Vulnerable | Species or species habitat may occur within area |
| Erythrotriorchis radiatus<br>Red Goshawk [942] | Endangered | Species or species habitat may occur within area |
| Falco hypoleucos<br>Grey Falcon [929] | Vulnerable | Species or species habitat known to occur within area |
| Limnodromus semipalmatus<br>Asian Dowitcher [843] | Vulnerable | Species or species habitat known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Limosa lapponica menzbieri<br>Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432] | Endangered | Species or species habitat known to occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Macronectes halli<br>Northern Giant Petrel [1061] | Vulnerable | Species or species habitat may occur within area |
| Malurus leucopterus edouardi<br>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<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area |
| Pezoporus occidentalis<br>Night Parrot [59350] | Endangered | Species or species habitat may occur within area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Foraging, feeding or related behaviour likely to occur within area |
| Phaethon rubricauda westralis<br>Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824] | Endangered | Breeding known to occur within area |
| Pterodroma mollis<br>Soft-plumaged Petrel [1036] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Rostratula australis<br>Australian Painted Snipe [77037] | Endangered | Species or species habitat likely to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| [Sternula albifrons](#)<br>Little Tern [82849] | Vulnerable | Breeding known to occur within area |
| [Sternula nereis nereis](#)<br>Australian Fairy Tern [82950] | Vulnerable | Breeding known to occur within area |
| [Thalassarche carteri](#)<br>Indian Yellow-nosed Albatross [64464] | Vulnerable | Species or species habitat may occur within area |
| [Thalassarche cauta](#)<br>Shy Albatross [89224] | Endangered | Species or species habitat may occur within area |
| [Thalassarche impavida](#)<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| [Thalassarche melanophris](#)<br>Black-browed Albatross [66472] | Vulnerable | Species or species habitat may occur within area |
| [Thalassarche steadi](#)<br>White-capped Albatross [64462] | Vulnerable | Species or species habitat may occur within area |
| [Tringa nebularia](#)<br>Common Greenshank, Greenshank [832] | Endangered | Species or species habitat likely to occur within area |
| CRUSTACEAN | | |
| [Kumonga exleyi](#)<br>Cape Range Remipede [86875] | Vulnerable | Species or species habitat known to occur within area |
| FISH | | |
| [Milyeringa justitia](#)<br>Barrow Cave Gudgeon [86867] | Endangered | Species or species habitat known to occur within area |
| [Milyeringa veritas](#)<br>Cape Range Cave Gudgeon, Blind Gudgeon [66676] | Vulnerable | Species or species habitat known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Ophisternon candidum | | |
| Blind Cave Eel [66678] | Vulnerable | Species or species habitat known to occur within area |
| MAMMAL | | |
| 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 known to 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 |
| Lagorchestes hirsutus Central Australian subspecies | | |
| Mala, Rufous Hare-Wallaby (Central Australia) [88019] | Endangered | Translocated population known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Macroderma gigas<br>Ghost Bat [174] | Vulnerable | Species or species habitat known to occur within area |
| Macrotis lagotis<br>Greater Bilby [282] | Vulnerable | Species or species habitat likely to occur within area |
| Orcaella heinsohni<br>Australian Snubfin Dolphin [81322] | Vulnerable | Species or species habitat known to occur within area |
| Osphranter robustus isabellinus<br>Barrow Island Wallaroo, Barrow Island Euro [89262] | Vulnerable | Species or species habitat likely to occur within area |
| Petrogale lateralis lateralis<br>Black-flanked Rock-wallaby, Moororong, Black-footed Rock Wallaby [66647] | Endangered | Species or species habitat known to occur within area |
| Rhinonicteris aurantia (Pilbara form)<br>Pilbara Leaf-nosed Bat [82790] | Vulnerable | Species or species habitat known to occur within area |
| Sousa sahulensis<br>Australian Humpback Dolphin [87942] | Vulnerable | Species or species habitat known to occur within area |
| PLANT | | |
| Minuria tridens<br>Minnie Daisy [13753] | Vulnerable | Species or species habitat may occur within area |
| REPTILE | | |
| Aipysurus apraefrontalis<br>Short-nosed Sea Snake, Short-nosed Seasnake [1115] | Critically Endangered | Species or species habitat known to occur within area |
| Aipysurus foliosquama<br>Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118] | Critically Endangered | Species or species habitat known to occur within area |
| Aipysurus fuscus<br>Dusky Sea Snake [1119] | Endangered | Species or species habitat known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Breeding known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Breeding known to occur within area |
| Ctenotus zastictus<br>Hamelin Ctenotus [25570] | Vulnerable | Species or species habitat known to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Breeding known to occur within area |
| Lepidochelys olivacea<br>Olive Ridley Turtle, Pacific Ridley Turtle [1767] | Endangered | Foraging, feeding or related behaviour likely to occur within area |
| Lerista nevinae<br>Nevin's Slider [85296] | Endangered | Species or species habitat known to occur within area |
| Liasis olivaceus barroni<br>Pilbara Olive Python [66699] | Vulnerable | Species or species habitat known to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Breeding known to occur within area |
| SHARK | | |
| Carcharias taurus (west coast population)<br>Grey Nurse Shark (west coast population) [68752] | Vulnerable | Congregation or aggregation known to occur within area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Centrophorus uyato<br>Little Gulper Shark [68446] | Conservation Dependent | Species or species habitat likely to occur within area |
| Glyphis garricki<br>Northern River Shark, New Guinea River Shark [82454] | Endangered | Species or species habitat may occur within area |
| Pristis clavata<br>Dwarf Sawfish, Queensland Sawfish [68447] | Vulnerable | Breeding known to occur within area |
| Pristis pristis<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat likely to occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Breeding known to occur within area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Sphyrna lewini<br>Scalloped Hammerhead [85267] | Conservation Dependent | Species or species habitat known to occur within area |

| Listed Migratory Species | | [ Resource Information ] |
|---|---|---|
| Scientific Name | Threatened Category | Presence Text |
| Migratory Marine Birds | | |
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat likely to occur within area |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardenna carneipes<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [82404] | | Foraging, feeding or related behaviour likely to occur within area |
| Ardenna pacifica<br>Wedge-tailed Shearwater [84292] | | Breeding known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat known to occur within area |
| Diomedea amsterdamensis<br>Amsterdam Albatross [64405] | Endangered | Species or species habitat likely to occur within area |
| Diomedea exulans<br>Wandering Albatross [89223] | Vulnerable | Species or species habitat may occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Breeding known to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Foraging, feeding or related behaviour likely to occur within area |
| Hydroprogne caspia<br>Caspian Tern [808] | | Breeding known to occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Macronectes halli<br>Northern Giant Petrel [1061] | Vulnerable | Species or species habitat may occur within area |
| Onychoprion anaethetus<br>Bridled Tern [82845] | | Breeding known to occur within area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Breeding known to occur within area |
| Phaethon rubricauda<br>Red-tailed Tropicbird [994] | | Breeding known to occur within area |
| Sterna dougallii<br>Roseate Tern [817] | | Breeding known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Sternula albifrons<br>Little Tern [82849] | Vulnerable | Breeding known to occur within area |
| Sula dactylatra<br>Masked Booby [1021] | | Breeding known to occur within area |
| Sula leucogaster<br>Brown Booby [1022] | | Breeding known to occur within area |
| Sula sula<br>Red-footed Booby [1023] | | Breeding known to occur within area |
| Thalassarche carteri<br>Indian Yellow-nosed Albatross [64464] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche cauta<br>Shy Albatross [89224] | Endangered | Species or species habitat may occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche melanophris<br>Black-browed Albatross [66472] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche steadi<br>White-capped Albatross [64462] | Vulnerable | Species or species habitat may occur within area |
| Migratory Marine Species | | |
| Anoxypristis cuspidata<br>Narrow Sawfish, Knifetooth Sawfish [68448] | | Species or species habitat known to occur within area |
| Balaenoptera bonaerensis<br>Antarctic Minke Whale, Dark-shoulder Minke Whale [67812] | | Species or species habitat likely to occur within area |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Migration route known to occur within area |
| Balaenoptera physalus<br>Fin Whale [37] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Carcharhinus longimanus<br>Oceanic Whitetip Shark [84108] | | Species or species habitat likely to occur within area |
| Carcharias taurus<br>Grey Nurse Shark [64469] | | Congregation or aggregation known to occur within area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat known to occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Breeding known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Breeding known to occur within area |
| Crocodylus porosus<br>Salt-water Crocodile, Estuarine Crocodile [1774] | | Species or species habitat likely to occur within area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| Dugong dugon<br>Dugong [28] | | Breeding known to occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Breeding known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Eubalaena australis as Balaena glacialis australis | | |
| Southern Right Whale [40] | Endangered | 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 |
| Lamna nasus | | |
| Porbeagle, Mackerel Shark [83288] | | Species or species habitat may occur within area |
| Lepidochelys olivacea | | |
| Olive Ridley Turtle, Pacific Ridley Turtle [1767] | Endangered | Foraging, feeding or related behaviour likely to occur within area |
| Megaptera novaeangliae | | |
| Humpback Whale [38] | | Breeding known to occur within area |
| Mobula alfredi as Manta alfredi | | |
| Reef Manta Ray, Coastal Manta Ray [90033] | | Species or species habitat known to occur within area |
| Mobula birostris as Manta birostris | | |
| Giant Manta Ray [90034] | | Species or species habitat known to occur within area |
| Natator depressus | | |
| Flatback Turtle [59257] | Vulnerable | Breeding known to occur within area |
| Orcaella heinsohni | | |
| Australian Snubfin Dolphin [81322] | Vulnerable | Species or species habitat known to occur within area |
| Orcinus orca | | |
| Killer Whale, Orca [46] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pristis clavata<br>Dwarf Sawfish, Queensland Sawfish [68447] | Vulnerable | Breeding known to occur within area |
| Pristis pristis<br>Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756] | Vulnerable | Species or species habitat likely to occur within area |
| Pristis zijsron<br>Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442] | Vulnerable | Breeding known to occur within area |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Sousa sahulensis as Sousa chinensis<br>Australian Humpback Dolphin [87942] | Vulnerable | Species or species habitat known to occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat known to occur within area |
| **Migratory Terrestrial Species** | | |
| Cecropis daurica<br>Red-rumped Swallow [80610] | | Species or species habitat may occur within area |
| Hirundo rustica<br>Barn Swallow [662] | | Species or species habitat known to occur within area |
| Motacilla cinerea<br>Grey Wagtail [642] | | Species or species habitat may occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| **Migratory Wetlands Species** | | |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat known to occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat known to occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat known to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat known to occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat known to occur within area |
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Species or species habitat known to occur within area |
| Charadrius veredus<br>Oriental Plover, Oriental Dotterel [882] | | Species or species habitat may occur within area |
| Glareola maldivarum<br>Oriental Pratincole [840] | | Species or species habitat may occur within area |
| Limnodromus semipalmatus<br>Asian Dowitcher [843] | Vulnerable | Species or species habitat known to occur within area |
| Limosa lapponica<br>Bar-tailed Godwit [844] | | Species or species habitat known to occur within area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Pandion haliaetus<br>Osprey [952] | | Breeding known to occur within area |
| Thalasseus bergii<br>Greater Crested Tern [83000] | | Breeding known to occur within area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | Endangered | Species or species habitat likely to occur within area |

## Other Matters Protected by the EPBC Act

### Commonwealth Lands [ 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.

| Commonwealth Land Name | State |
|---|---|
| **Defence** | |
| Defence - EXMOUTH ADMIN & HF TRANSMITTING [50124] | WA |
| Defence - EXMOUTH ADMIN & HF TRANSMITTING [50125] | WA |
| Defence - EXMOUTH ADMIN & HF TRANSMITTING [50126] | WA |
| Defence - EXMOUTH ADMIN & HF TRANSMITTING [50127] | WA |
| Defence - EXMOUTH ADMIN & HF TRANSMITTING [50129] | WA |
| Defence - EXMOUTH ADMIN & HF TRANSMITTING [50128] | WA |
| Defence - EXMOUTH VLF TRANSMITTER STATION [50122] | WA |
| Defence - EXMOUTH VLF TRANSMITTER STATION [50123] | WA |
| Defence - LEARMONTH - AIR WEAPONS RANGE [50193] | WA |
| Defence - LEARMONTH RADAR SITE - TWIN TANKS EXMOUTH [50002] | WA |
| Defence - LEARMONTH RADAR SITE - VLAMING HEAD EXMOUTH [50001] | WA |
| **Unknown** | |
| Commonwealth Land - [51471] | WA |
| Commonwealth Land - [51473] | WA |
| Commonwealth Land - [51472] | WA |

| Commonwealth Land Name | State |
|---|---|
| Commonwealth Land - [51476] | WA |
| Commonwealth Land - [51474] | WA |
| Commonwealth Land - [51458] | WA |
| Commonwealth Land - [51884] | WA |
| Commonwealth Land - [51465] | WA |
| Commonwealth Land - [51466] | WA |
| Commonwealth Land - [51469] | WA |
| Commonwealth Land - [51464] | WA |
| Commonwealth Land - [51470] | WA |
| Commonwealth Land - [51468] | WA |
| Commonwealth Land - [51477] | WA |
| Commonwealth Land - [51475] | WA |
| Commonwealth Land - [51459] | WA |
| Commonwealth Land - [52236] | WA |
| Commonwealth Land - [51462] | WA |
| Commonwealth Land - [51463] | WA |
| Commonwealth Land - [51467] | WA |
| Commonwealth Land - [51460] | WA |
| Commonwealth Land - [51461] | WA |
| Commonwealth Land - [51448] | WA |
| Commonwealth Land - [51455] | WA |
| Commonwealth Land - [51449] | WA |
| Commonwealth Land - [51457] | WA |
| Commonwealth Land - [51454] | WA |
| Commonwealth Land - [51451] | WA |
| Commonwealth Land - [51456] | WA |
| Commonwealth Land - [51453] | WA |

| Commonwealth Land Name | State |
|---|---|
| Commonwealth Land - [51450] | WA |
| Commonwealth Land - [51452] | WA |
| Commonwealth Land - [51442] | WA |
| Commonwealth Land - [51446] | WA |
| Commonwealth Land - [51443] | WA |
| Commonwealth Land - [51447] | WA |
| Commonwealth Land - [51444] | WA |
| Commonwealth Land - [51445] | WA |

## Commonwealth Heritage Places [ Resource Information ]

| Name | State | Status |
|---|---|---|
| Natural | | |
| Learmonth Air Weapons Range Facility | WA | Listed place |
| Mermaid Reef - Rowley Shoals | WA | Listed place |
| Ningaloo Marine Area - Commonwealth Waters | WA | Listed place |
| Scott Reef and Surrounds - Commonwealth Area | EXT | Listed place |

## Listed Marine Species [ Resource Information ]

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Bird | | |
| Actitis hypoleucos | | |
| Common Sandpiper [59309] | | Species or species habitat known to occur within area |
| Anous stolidus | | |
| Common Noddy [825] | | Species or species habitat likely to occur within area |
| Anous tenuirostris melanops | | |
| Australian Lesser Noddy [26000] | Vulnerable | Foraging, feeding or related behaviour known to occur within area |
| Apus pacificus | | |
| Fork-tailed Swift [678] | | Species or species habitat likely to occur within area overfly marine area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Ardenna carneipes as Puffinus carneipes<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [82404] | | Foraging, feeding or related behaviour likely to occur within area |
| Ardenna pacifica as Puffinus pacificus<br>Wedge-tailed Shearwater [84292] | | Breeding known to occur within area |
| Bubulcus ibis as Ardea ibis<br>Cattle Egret [66521] | | Species or species habitat may occur within area overfly marine area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | Vulnerable | Species or species habitat known to occur within area |
| Calidris canutus<br>Red Knot, Knot [855] | Vulnerable | Species or species habitat known to occur within area overfly marine area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat known to occur within area overfly marine area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat known to occur within area overfly marine area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat known to occur within area |
| Cecropis daurica as Hirundo daurica<br>Red-rumped Swallow [80610] | | Species or species habitat may occur within area overfly marine area |
| Chalcites osculans as Chrysococcyx osculans<br>Black-eared Cuckoo [83425] | | Species or species habitat known to occur within area overfly marine area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Species or species habitat known to occur within area |
| Charadrius veredus<br>Oriental Plover, Oriental Dotterel [882] | | Species or species habitat may occur within area overfly marine area |
| Chroicocephalus novaehollandiae as Larus novaehollandiae<br>Silver Gull [82326] | | Breeding known to occur within area |
| Diomedea amsterdamensis<br>Amsterdam Albatross [64405] | Endangered | Species or species habitat likely to occur within area |
| Diomedea exulans<br>Wandering Albatross [89223] | Vulnerable | Species or species habitat may occur within area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Breeding known to occur within area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Foraging, feeding or related behaviour likely to occur within area |
| Glareola maldivarum<br>Oriental Pratincole [840] | | Species or species habitat may occur within area overfly marine area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat known to occur within area |
| Hirundo rustica<br>Barn Swallow [662] | | Species or species habitat known to occur within area overfly marine area |
| Hydroprogne caspia as Sterna caspia<br>Caspian Tern [808] | | Breeding known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Larus pacificus<br>Pacific Gull [811] | | Breeding known to occur within area |
| Limnodromus semipalmatus<br>Asian Dowitcher [843] | Vulnerable | Species or species habitat known to occur within area overfly marine area |
| Limosa lapponica<br>Bar-tailed Godwit [844] | | Species or species habitat known to occur within area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area |
| Macronectes halli<br>Northern Giant Petrel [1061] | Vulnerable | Species or species habitat may occur within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area overfly marine area |
| Motacilla cinerea<br>Grey Wagtail [642] | | Species or species habitat may occur within area overfly marine area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area overfly marine area |
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area |
| Onychoprion anaethetus as Sterna anaethetus<br>Bridled Tern [82845] | | Breeding known to occur within area |
| Onychoprion fuscatus as Sterna fuscata<br>Sooty Tern [90682] | | Breeding known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Pandion haliaetus<br>Osprey [952] | | Breeding known to occur within area |
| Papasula abbotti<br>Abbott's Booby [59297] | Endangered | Species or species habitat may occur within area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Breeding known to occur within area |
| Phaethon lepturus fulvus<br>Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021] | Endangered | Foraging, feeding or related behaviour likely to occur within area |
| Phaethon rubricauda<br>Red-tailed Tropicbird [994] | | Breeding known to occur within area |
| Pterodroma macroptera<br>Great-winged Petrel [1035] | | Foraging, feeding or related behaviour known to occur within area |
| Pterodroma mollis<br>Soft-plumaged Petrel [1036] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| Rostratula australis as Rostratula benghalensis (sensu lato)<br>Australian Painted Snipe [77037] | Endangered | Species or species habitat likely to occur within area overfly marine area |
| Stercorarius antarcticus as Catharacta skua<br>Brown Skua [85039] | | Species or species habitat may occur within area |
| Sterna dougallii<br>Roseate Tern [817] | | Breeding known to occur within area |
| Sternula albifrons as Sterna albifrons<br>Little Tern [82849] | Vulnerable | Breeding known to occur within area |
| Sternula nereis as Sterna nereis<br>Fairy Tern [82949] | | Breeding known to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Sula dactylatra<br>Masked Booby [1021] | | Breeding known to occur within area |
| Sula leucogaster<br>Brown Booby [1022] | | Breeding known to occur within area |
| Sula sula<br>Red-footed Booby [1023] | | Breeding known to occur within area |
| Thalassarche carteri<br>Indian Yellow-nosed Albatross [64464] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche cauta<br>Shy Albatross [89224] | Endangered | Species or species habitat may occur within area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche melanophris<br>Black-browed Albatross [66472] | Vulnerable | Species or species habitat may occur within area |
| Thalassarche steadi<br>White-capped Albatross [64462] | Vulnerable | Species or species habitat may occur within area |
| Thalasseus bengalensis as Sterna bengalensis<br>Lesser Crested Tern [66546] | | Breeding known to occur within area |
| Thalasseus bergii as Sterna bergii<br>Greater Crested Tern [83000] | | Breeding known to occur within area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | Endangered | Species or species habitat likely to occur within area overfly marine area |
| Fish | | |
| Acentronura larsonae<br>Helen's Pygmy Pipehorse [66186] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Bhanotia fasciolata<br>Corrugated Pipefish, Barbed Pipefish [66188] | | Species or species habitat may occur within area |
| Bulbonaricus brauni<br>Braun's Pughead Pipefish, Pug-headed Pipefish [66189] | | Species or species habitat may occur within area |
| Campichthys galei<br>Gale's Pipefish [66191] | | Species or species habitat may occur within area |
| Campichthys tricarinatus<br>Three-keel Pipefish [66192] | | Species or species habitat may occur within area |
| Choeroichthys brachysoma<br>Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194] | | Species or species habitat may occur within area |
| Choeroichthys latispinosus<br>Muiron Island Pipefish [66196] | | Species or species habitat may occur within area |
| Choeroichthys suillus<br>Pig-snouted Pipefish [66198] | | Species or species habitat may occur within area |
| Corythoichthys amplexus<br>Fijian Banded Pipefish, Brown-banded Pipefish [66199] | | Species or species habitat may occur within area |
| Corythoichthys flavofasciatus<br>Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200] | | Species or species habitat may occur within area |
| Corythoichthys intestinalis<br>Australian Messmate Pipefish, Banded Pipefish [66202] | | Species or species habitat may occur within area |
| Corythoichthys schultzi<br>Schultz's Pipefish [66205] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Cosmocampus banneri<br>Roughridge Pipefish [66206] | | Species or species habitat may occur within area |
| Doryrhamphus dactyliophorus<br>Banded Pipefish, Ringed Pipefish [66210] | | Species or species habitat may occur within area |
| Doryrhamphus excisus<br>Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211] | | Species or species habitat may occur within area |
| Doryrhamphus janssi<br>Cleaner Pipefish, Janss' Pipefish [66212] | | Species or species habitat may occur within area |
| Doryrhamphus multiannulatus<br>Many-banded Pipefish [66717] | | Species or species habitat may occur within area |
| Doryrhamphus negrosensis<br>Flagtail Pipefish, Masthead Island Pipefish [66213] | | Species or species habitat may occur within area |
| Festucalex scalaris<br>Ladder Pipefish [66216] | | Species or species habitat may occur within area |
| Filicampus tigris<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area |
| Halicampus brocki<br>Brock's Pipefish [66219] | | Species or species habitat may occur within area |
| Halicampus dunckeri<br>Red-hair Pipefish, Duncker's Pipefish [66220] | | Species or species habitat may occur within area |
| Halicampus grayi<br>Mud Pipefish, Gray's Pipefish [66221] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Halicampus nitidus<br>Glittering Pipefish [66224] | | Species or species habitat may occur within area |
| Halicampus spinirostris<br>Spiny-snout Pipefish [66225] | | Species or species habitat may occur within area |
| Haliichthys taeniophorus<br>Ribboned Pipehorse, Ribboned Seadragon [66226] | | Species or species habitat may occur within area |
| Hippichthys penicillus<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area |
| Hippocampus angustus<br>Western Spiny Seahorse, Narrow-bellied Seahorse [66234] | | Species or species habitat may occur within area |
| Hippocampus histrix<br>Spiny Seahorse, Thorny Seahorse [66236] | | Species or species habitat may occur within area |
| Hippocampus kuda<br>Spotted Seahorse, Yellow Seahorse [66237] | | Species or species habitat may occur within area |
| Hippocampus planifrons<br>Flat-face Seahorse [66238] | | Species or species habitat may occur within area |
| Hippocampus spinosissimus<br>Hedgehog Seahorse [66239] | | Species or species habitat may occur within area |
| Hippocampus trimaculatus<br>Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720] | | Species or species habitat may occur within area |
| Lissocampus fatiloquus<br>Prophet's Pipefish [66250] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Micrognathus micronotopterus<br>Tidepool Pipefish [66255] | | Species or species habitat may occur within area |
| Nannocampus subosseus<br>Bonyhead Pipefish, Bony-headed Pipefish [66264] | | Species or species habitat may occur within area |
| Phoxocampus belcheri<br>Black Rock Pipefish [66719] | | Species or species habitat may occur within area |
| Solegnathus hardwickii<br>Pallid Pipehorse, Hardwick's Pipehorse [66272] | | Species or species habitat may occur within area |
| Solegnathus lettiensis<br>Gunther's Pipehorse, Indonesian Pipefish [66273] | | Species or species habitat may occur within area |
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area |
| Stigmatopora argus<br>Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276] | | Species or species habitat may occur within area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area |
| Trachyrhamphus longirostris<br>Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281] | | Species or species habitat may occur within area |
| Mammal | | |
| Dugong dugon<br>Dugong [28] | | Breeding known to occur within area |
| Reptile | | |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Aipysurus apraefrontalis<br>Short-nosed Sea Snake, Short-nosed Seasnake [1115] | Critically Endangered | Species or species habitat known to occur within area |
| Aipysurus duboisii<br>Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116] | | Species or species habitat may occur within area |
| Aipysurus foliosquama<br>Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118] | Critically Endangered | Species or species habitat known to occur within area |
| Aipysurus fuscus<br>Dusky Sea Snake [1119] | Endangered | Species or species habitat known to occur within area |
| Aipysurus laevis<br>Olive Sea Snake, Olive-brown Sea Snake [1120] | | Species or species habitat may occur within area |
| Aipysurus mosaicus as Aipysurus eydouxii<br>Mosaic Sea Snake [87261] | | Species or species habitat may occur within area |
| Aipysurus pooleorum<br>Shark Bay Sea Snake [66061] | | Species or species habitat may occur within area |
| Aipysurus tenuis<br>Brown-lined Sea Snake, Mjoberg's Sea Snake [1121] | | Species or species habitat may occur within area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Breeding known to occur within area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Breeding known to occur within area |
| Crocodylus porosus<br>Salt-water Crocodile, Estuarine Crocodile [1774] | | Species or species habitat likely to occur within area |

| Scientific Name | Threatened Category | Presence Text |
| --- | --- | --- |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Foraging, feeding or related behaviour known to occur within area |
| Emydocephalus annulatus<br>Eastern Turtle-headed Sea Snake [1125] | | Species or species habitat may occur within area |
| Ephalophis greyae as Ephalophis greyi<br>Mangrove Sea Snake [93738] | | Species or species habitat may occur within area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Breeding known to occur within area |
| Hydrelaps darwiniensis<br>Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100] | | Species or species habitat may occur within area |
| Hydrophis coggeri<br>Cogger's Sea Snake, Black-headed Sea Snake [25925] | | Species or species habitat may occur within area |
| Hydrophis czeblukovi<br>Fine-spined Sea Snake [59233] | | Species or species habitat may occur within area |
| Hydrophis elegans<br>Elegant Sea Snake, Bar-bellied Sea Snake [1104] | | Species or species habitat may occur within area |
| Hydrophis hardwickii as Lapemis hardwickii<br>Spine-bellied Sea Snake [93516] | | Species or species habitat may occur within area |
| Hydrophis kingii as Disteira kingii<br>Spectacled Sea Snake [93511] | | Species or species habitat may occur within area |
| Hydrophis macdowelli as Hydrophis mcdowelli<br>MacDowell's Sea Snake, Small-headed Sea Snake, [75601] | | Species or species habitat may occur within area |

| Scientific Name | Threatened Category | Presence Text |
|---|---|---|
| Hydrophis major as Disteira major<br>Olive-headed Sea Snake [93512] | | Species or species habitat may occur within area |
| Hydrophis ornatus<br>Spotted Sea Snake, Ornate Reef Sea Snake [1111] | | Species or species habitat may occur within area |
| Hydrophis peronii as Acalyptophis peronii<br>Horned Sea Snake [93509] | | Species or species habitat may occur within area |
| Hydrophis platura as Pelamis platurus<br>Yellow-bellied Sea Snake [93746] | | Species or species habitat may occur within area |
| Hydrophis stokesii as Astrotia stokesii<br>Stokes' Sea Snake [93510] | | Species or species habitat may occur within area |
| Lepidochelys olivacea<br>Olive Ridley Turtle, Pacific Ridley Turtle [1767] | Endangered | Foraging, feeding or related behaviour likely to occur within area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Breeding known to occur within area |

| Whales and Other Cetaceans | | [ Resource Information ] |
|---|---|---|
| Current Scientific Name | Status | Type of Presence |
| Mammal | | |
| Balaenoptera acutorostrata<br>Minke Whale [33] | | Species or species habitat may occur within area |
| Balaenoptera bonaerensis<br>Antarctic Minke Whale, Dark-shoulder Minke Whale [67812] | | Species or species habitat likely to occur within area |
| Balaenoptera borealis<br>Sei Whale [34] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |

| Current Scientific Name | Status | Type of Presence |
| --- | --- | --- |
| [Balaenoptera edeni](#)<br>Bryde's Whale [35] | | Species or species habitat likely to occur within area |
| [Balaenoptera musculus](#)<br>Blue Whale [36] | Endangered | Migration route known to occur within area |
| [Balaenoptera physalus](#)<br>Fin Whale [37] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area |
| [Delphinus delphis](#)<br>Common Dolphin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area |
| [Eubalaena australis](#)<br>Southern Right Whale [40] | Endangered | Species or species habitat likely to occur within area |
| [Feresa attenuata](#)<br>Pygmy Killer Whale [61] | | Species or species habitat may occur within area |
| [Globicephala macrorhynchus](#)<br>Short-finned Pilot Whale [62] | | Species or species habitat may occur within area |
| [Grampus griseus](#)<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area |
| [Indopacetus pacificus](#)<br>Longman's Beaked Whale [72] | | Species or species habitat may occur within area |
| [Kogia breviceps](#)<br>Pygmy Sperm Whale [57] | | Species or species habitat may occur within area |
| [Kogia sima](#)<br>Dwarf Sperm Whale [85043] | | Species or species habitat may occur within area |

| Current Scientific Name | Status | Type of Presence |
| --- | --- | --- |
| Lagenodelphis hosei<br>Fraser's Dolphin, Sarawak Dolphin [41] | | Species or species habitat may occur within area |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Breeding known to occur within area |
| Mesoplodon densirostris<br>Blainville's Beaked Whale, Dense-beaked Whale [74] | | Species or species habitat may occur within area |
| Mesoplodon ginkgodens<br>Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564] | | Species or species habitat may occur within area |
| Mesoplodon grayi<br>Gray's Beaked Whale, Scamperdown Whale [75] | | Species or species habitat may occur within area |
| Orcaella heinsohni<br>Australian Snubfin Dolphin [81322] | Vulnerable | Species or species habitat known to occur within area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area |
| Peponocephala electra<br>Melon-headed Whale [47] | | Species or species habitat may occur within area |
| Physeter macrocephalus<br>Sperm Whale [59] | | Species or species habitat may occur within area |
| Pseudorca crassidens<br>False Killer Whale [48] | | Species or species habitat likely to occur within area |
| Sousa sahulensis<br>Australian Humpback Dolphin [87942] | Vulnerable | Species or species habitat known to occur within area |

| Current Scientific Name | Status | Type of Presence |
|---|---|---|
| Stenella attenuata<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area |
| Stenella coeruleoalba<br>Striped Dolphin, Euphrosyne Dolphin [52] | | Species or species habitat may occur within area |
| Stenella longirostris<br>Long-snouted Spinner Dolphin [29] | | Species or species habitat may occur within area |
| Steno bredanensis<br>Rough-toothed Dolphin [30] | | Species or species habitat may occur within area |
| Tursiops aduncus<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat likely to occur within area |
| Tursiops aduncus (Arafura/Timor Sea populations)<br>Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900] | | Species or species habitat known to occur within area |
| Tursiops truncatus s. str.<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area |
| Ziphius cavirostris<br>Cuvier's Beaked Whale, Goose-beaked Whale [56] | | Species or species habitat may occur within area |

| Australian Marine Parks | [ Resource Information ] |
|---|---|
| Park Name | Zone & IUCN Categories |
| Carnarvon Canyon | Habitat Protection Zone (IUCN IV) |
| Dampier | Habitat Protection Zone (IUCN IV) |
| Gascoyne | Habitat Protection Zone (IUCN IV) |
| Gascoyne | Habitat Protection Zone (IUCN IV) |

| Park Name | Zone & IUCN Categories |
|---|---|
| Argo-Rowley Terrace | Multiple Use Zone (IUCN VI) |
| Argo-Rowley Terrace | Multiple Use Zone (IUCN VI) |
| Dampier | Multiple Use Zone (IUCN VI) |
| Eighty Mile Beach | Multiple Use Zone (IUCN VI) |
| Gascoyne | Multiple Use Zone (IUCN VI) |
| Kimberley | Multiple Use Zone (IUCN VI) |
| Montebello | Multiple Use Zone (IUCN VI) |
| Shark Bay | Multiple Use Zone (IUCN VI) |
| Argo-Rowley Terrace | National Park Zone (IUCN II) |
| Dampier | National Park Zone (IUCN II) |
| Gascoyne | National Park Zone (IUCN II) |
| Mermaid Reef | National Park Zone (IUCN II) |
| Ningaloo | National Park Zone (IUCN II) |
| Ningaloo | Recreational Use Zone (IUCN IV) |
| Ningaloo | Recreational Use Zone (IUCN IV) |
| Argo-Rowley Terrace | Special Purpose Zone (Trawl) (IUCN VI) |

## Habitat Critical to the Survival of Marine Turtles

[ Resource Information ]

| Scientific Name | Behaviour | Presence |
|---|---|---|
| All year (Jun - Aug) | | |
| Natator depressus<br>Flatback Turtle [59257] | Nesting | Known to occur |
| Nov-Feb | | |
| Caretta caretta<br>Loggerhead Turtle [1763] | Nesting | Known to occur |
| Oct - Feb | | |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Nesting | Known to occur |
| Oct - Mar | | |

| Scientific Name | Behaviour | Presence |
|---|---|---|
| Chelonia mydas | | |
| Green Turtle [1765] | Nesting | Known to occur |

## Extra Information

| State and Territory Reserves | | [ Resource Information ] |
|---|---|---|
| Protected Area Name | Reserve Type | State |
| Airlie Island | Nature Reserve | WA |
| Barrow Island | Nature Reserve | WA |
| Barrow Island | Marine Park | WA |
| Barrow Island | Marine Management Area | WA |
| Bedout Island | Nature Reserve | WA |
| Bessieres Island | Nature Reserve | WA |
| Boodie, Double Middle Islands | Nature Reserve | WA |
| Bundegi Coastal Park | 5(1)(h) Reserve | WA |
| Cape Range | National Park | WA |
| Cape Range (South) | National Park | WA |
| Eighty Mile Beach | Marine Park | WA |
| Great Sandy Island | Nature Reserve | WA |
| Great Sandy Island | Nature Reserve | WA |
| Jurabi Coastal Park | 5(1)(h) Reserve | WA |
| Little Rocky Island | Nature Reserve | WA |
| Locker Island | Nature Reserve | WA |
| Lowendal Islands | Nature Reserve | WA |
| Montebello Islands | Conservation Park | WA |
| Montebello Islands | Marine Park | WA |

| Protected Area Name | Reserve Type | State |
|---|---|---|
| Montebello Islands | Conservation Park | WA |
| Muiron Islands | Nature Reserve | WA |
| Muiron Islands | Marine Management Area | WA |
| Murujuga | 5(1)(h) Reserve | WA |
| Murujuga | National Park | WA |
| Ningaloo | Marine Park | WA |
| North Sandy Island | Nature Reserve | WA |
| Nyingguulu (Ningaloo) Coastal Reserve | 5(1)(h) Reserve | WA |
| Rocky Island | Nature Reserve | WA |
| Round Island | Nature Reserve | WA |
| Rowley Shoals | Marine Park | WA |
| Scott Reef | Nature Reserve | WA |
| Serrurier Island | Nature Reserve | WA |
| Thevenard Island | Nature Reserve | WA |
| Thevenard Island | Nature Reserve | WA |
| Unnamed WA36907 | 5(1)(h) Reserve | WA |
| Unnamed WA36909 | 5(1)(h) Reserve | WA |
| Unnamed WA36910 | 5(1)(h) Reserve | WA |
| Unnamed WA36913 | Nature Reserve | WA |
| Unnamed WA36915 | Nature Reserve | WA |
| Unnamed WA37500 | 5(1)(g) Reserve | WA |
| Unnamed WA40322 | 5(1)(h) Reserve | WA |
| Unnamed WA40877 | 5(1)(h) Reserve | WA |
| Unnamed WA44665 | 5(1)(h) Reserve | WA |
| Unnamed WA44667 | 5(1)(h) Reserve | WA |
| Unnamed WA44672 | 5(1)(h) Reserve | WA |

| Protected Area Name | Reserve Type | State |
|---|---|---|
| Victor Island | Nature Reserve | WA |
| Y Island | Nature Reserve | WA |

## Nationally Important Wetlands [ Resource Information ]

| Wetland Name | State |
|---|---|
| Bundera Sinkhole | WA |
| Cape Range Subterranean Waterways | WA |
| Exmouth Gulf East | WA |
| Learmonth Air Weapons Range - Saline Coastal Flats | WA |
| Mermaid Reef | EXT |

## EPBC Act Referrals [ Resource Information ]

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| 2 geotechnical surveys - preliminary and final | 2006/2886 | | Completed |
| 3D Seismic Survey in the Carnarvon Bsin on the North West Shelf | 2002/778 | | Completed |
| Babylon 3D Marine Seismic Survey, Commonwealth Waters, nr Exmouth WA | 2013/7081 | | Completed |
| Balla Balla Export Facilities ? Design Variation | 2022/09254 | | Assessment |
| Boskalis Cambridge Gulf Marine Sand Sourcing Project | 2025/10106 | | Referral Decision |
| Browse Carbon Capture and Storage Project | 2024/10028 | | Referral Decision |
| Browse to North West Shelf Development, Indian Ocean, WA | 2018/8319 | | Approval |
| DAVROS MC 3D marine seismic survey northwaet of Dampier, WA | 2013/7092 | | Completed |
| Deep Water Northwest Shelf 2D Seismic Survey | 2007/3260 | | Completed |
| Development of Mutineer and Exeter petroleum fields for oil production, Permit | 2003/1033 | | Completed |
| Gorgon Gas Development | 2003/1294 | | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| | | | |
| Marine Route Survey for Subsea Fibre Optic Data Cable System - Australia West | 2024/09826 | | Completed |
| Ningaloo Lighthouse Development, 17km north west Exmouth, Western Australia | 2020/8693 | | Post-Approval |
| North West Shelf Project Extension, Carnarvon Basin, WA | 2018/8335 | | Approval |
| Offshore Dredge Spoil Disposal - Mardie Project | 2024/10054 | | Referral Decision |
| Optimised Mardie Project ? Additional Triodia Grassland Habitat Clearing | 2024/10094 | | Referral Decision |
| Optimised Mardie Solar Salt Project | 2022/9169 | | Post-Approval |
| Project Highclere Cable Lay and Operation | 2022/09203 | | Completed |
| Action clearly unacceptable | | | |
| Highlands 3D Marine Seismic Survey | 2012/6680 | Action Clearly Unacceptable | Completed |
| Controlled action | | | |
| 'Van Gogh' Petroleum Field Development | 2007/3213 | Controlled Action | Post-Approval |
| 2-D seismic survey Scott Reef | 2000/125 | Controlled Action | Post-Approval |
| Anketell Point Iron Ore Processing & Export Port | 2009/5120 | Controlled Action | Post-Approval |
| Balmoral South Iron Ore Mine | 2008/4236 | Controlled Action | Post-Approval |
| Binowee Iron Ore Project | 2001/366 | Controlled Action | Proposed Decision |
| Boating Facility | 2002/830 | Controlled Action | Completed |
| Browse FLNG Development, Commonwealth Waters | 2013/7079 | Controlled Action | Post-Approval |
| Cape Lambert Port B Development | 2008/4032 | Controlled Action | Post-Approval |
| Conduct an exploration drilling campaign | 2010/5718 | Controlled Action | Completed |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Controlled action | | | |
| Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatston | 2008/4469 | Controlled Action | Post-Approval |
| Construction and operation of a Solar Salt Project, SW Onslow, WA | 2016/7793 | Controlled Action | Assessment Approach |
| Develop Ichthys gas-condensate field permit area W | 2006/2767 | Controlled Action | Completed |
| Develop Jansz-Io deepwater gas field in Permit Areas WA-18-R, WA-25-R and WA-26- | 2005/2184 | Controlled Action | Post-Approval |
| Development of Angel gas and condensate field, North West Shelf | 2004/1805 | Controlled Action | Post-Approval |
| Development of an iron ore mine and associated infrastructure | 2010/5630 | Controlled Action | Assessment Approach |
| Development of Browse Basin Gas Fields (Upstream) | 2008/4111 | Controlled Action | Completed |
| Development of Coniston/Novara fields within the Exmouth Sub-basin | 2011/5995 | Controlled Action | Post-Approval |
| Development of Stybarrow petroleum field incl drilling and facility installation | 2004/1469 | Controlled Action | Post-Approval |
| Echo-Yodel Production Wells | 2000/11 | Controlled Action | Post-Approval |
| Enfield full field development | 2001/257 | Controlled Action | Post-Approval |
| Equus Gas Fields Development Project, Carnarvon Basin | 2012/6301 | Controlled Action | Completed |
| Eramurra Industrial Salt Project | 2021/9027 | Controlled Action | Assessment Approach |
| Eramurra Industrial Salt Project, near Karratha, WA | 2019/8448 | Controlled Action | Completed |
| Gorgon Gas Development 4th Train Proposal | 2011/5942 | Controlled Action | Post-Approval |
| Gorgon Gas Revised Development | 2008/4178 | Controlled Action | Post-Approval |
| Greater Enfield (Vincent) Development | 2005/2110 | Controlled Action | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Controlled action | | | |
| Greater Gorgon Development - Optical Fibre Cable, Mainland to Barrow Island | 2005/2141 | Controlled Action | Completed |
| Ichthys Gas Field, Offshore and onshore processing facilities and subsea pipeline | 2008/4208 | Controlled Action | Post-Approval |
| Light Crude Oil Production | 2001/365 | Controlled Action | Post-Approval |
| Mardie Project, 80 km south west of Karratha, WA | 2018/8236 | Controlled Action | Post-Approval |
| Mauds Landing Marina | 2000/98 | Controlled Action | Completed |
| Nava-1 Cable System | 2001/510 | Controlled Action | Completed |
| Pluto Gas Project | 2005/2258 | Controlled Action | Completed |
| Pluto Gas Project Including Site B | 2006/2968 | Controlled Action | Post-Approval |
| Port Hedland Outer Harbour Development and associated marine and terrestrial in | 2008/4159 | Controlled Action | Post-Approval |
| Proposed West Pilbara Iron Ore Project | 2009/4706 | Controlled Action | Post-Approval |
| Pyrenees Oil Fields Development | 2005/2034 | Controlled Action | Post-Approval |
| Simpson Development | 2000/59 | Controlled Action | Completed |
| Simpson Oil Field Development | 2001/227 | Controlled Action | Post-Approval |
| The Scarborough Project - FLNG & assoc subsea infrastructure, Carnarvon Basin | 2013/6811 | Controlled Action | Post-Approval |
| Torosa South Initial Appraisal Drilling | 2007/3500 | Controlled Action | Completed |
| Vincent Appraisal Well | 2000/22 | Controlled Action | Post-Approval |
| Yardie Creek Road Realignment Project | 2021/8967 | Controlled Action | Assessment Approach |
| Not controlled action | | | |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action | | | |
| 'Goodwyn A' Low Pressure Train Project | 2003/914 | Not Controlled Action | Completed |
| 'Van Gogh' Oil Appraisal Drilling Program, Exploration Permit Area WA-155-P(1) | 2006/3148 | Not Controlled Action | Completed |
| 3D marine seismic survey in WA 314P and WA 315P | 2004/1927 | Not Controlled Action | Completed |
| Adele Trend TQ3D Seismic Survey | 2001/252 | Not Controlled Action | Completed |
| Airlie Island soil and groundwater investigations, Exmouth Gulf, offshore Pilbara coast | 2014/7250 | Not Controlled Action | Completed |
| Baniyas-1 Exploration Well, EP-424, near Onslow | 2007/3282 | Not Controlled Action | Completed |
| Barrow Island 2D Seismic survey | 2006/2667 | Not Controlled Action | Completed |
| Boating Facility | 2002/832 | Not Controlled Action | Completed |
| Bollinger 2D Seismic Survey 200km North of North West Cape WA | 2004/1868 | Not Controlled Action | Completed |
| Bultaco-2, Laverda-2, Laverda-3 and Montesa-2 Appraisal Wells | 2000/103 | Not Controlled Action | Completed |
| Cape Lambert Port A Marine Structures Refurbishment Project | 2018/8370 | Not Controlled Action | Completed |
| Carnarvon 3D Marine Seismic Survey | 2004/1890 | Not Controlled Action | Completed |
| Cazadores 2D seismic survey | 2004/1720 | Not Controlled Action | Completed |
| Construction and operation of an unmanned sea platform and connecting pipeline to Varanus Island for | 2004/1703 | Not Controlled Action | Completed |
| Controlled Source Electromagnetic Survey | 2007/3262 | Not Controlled Action | Completed |
| Development of Halyard Field off the west coast of WA | 2010/5611 | Not Controlled Action | Completed |
| Development of iron ore facilities | 2013/7013 | Not Controlled Action | Completed |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action | | | |
| Differential Global Positioning System (DGPS) | 2001/445 | Not Controlled Action | Completed |
| Drilling of an exploration well Gats-1 in Permit Area WA-261-P | 2004/1701 | Not Controlled Action | Completed |
| Drilling of exploration wells, Permit areas WA-301-P to WA-305-P | 2002/769 | Not Controlled Action | Completed |
| Eagle-1 Exploration Drilling, North West Shelf, WA | 2019/8578 | Not Controlled Action | Completed |
| Echo A Development WA-23-L, WA-24-L | 2005/2042 | Not Controlled Action | Completed |
| Expansion of the Sino Iron Ore Mine and export facilities, Cape Preston, WA | 2017/7862 | Not Controlled Action | Completed |
| Expansion Proposal, Mineralogy Cape Preston Iron Ore Project, Cape Preston, WA | 2009/5010 | Not Controlled Action | Completed |
| Exploration drilling well WA-155-P(1) | 2003/971 | Not Controlled Action | Completed |
| Exploration of appraisal wells | 2006/3065 | Not Controlled Action | Completed |
| Exploration Well (Taunton-2) | 2002/731 | Not Controlled Action | Completed |
| Exploration Well in Permit Area WA-155-P(1) | 2002/759 | Not Controlled Action | Completed |
| Exploratory drilling in permit area WA-225-P | 2001/490 | Not Controlled Action | Completed |
| Extension of Simpson Oil Platforms & Wells | 2002/685 | Not Controlled Action | Completed |
| HCA05X Macedon Experimental Survey | 2004/1926 | Not Controlled Action | Completed |
| Hess Exploration Drilling Programme | 2007/3566 | Not Controlled Action | Completed |
| Huascaran-1 exploration well (WA-292-P) | 2001/539 | Not Controlled Action | Completed |
| Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia | 2015/7522 | Not Controlled Action | Completed |
| INDIGO West Submarine Telecommunications Cable, WA | 2017/8126 | Not Controlled Action | Completed |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action | | | |
| Infill Production Well (Griffin-9) | 2001/417 | Not Controlled Action | Completed |
| Jansz-2 and 3 Appraisal Wells | 2002/754 | Not Controlled Action | Completed |
| Klammer 2D Seismic Survey | 2002/868 | Not Controlled Action | Completed |
| Mahimahi Aquaculture Facility | 2002/891 | Not Controlled Action | Completed |
| Maia-Gaea Exploration wells | 2000/17 | Not Controlled Action | Completed |
| Manaslu - 1 and Huascaran - 1 Offshore Exploration Wells | 2001/235 | Not Controlled Action | Completed |
| Mermaid Marine Australia Desalination Project | 2011/5916 | Not Controlled Action | Completed |
| Montesa-1 and Bultaco-1 Exploration Wells | 2000/102 | Not Controlled Action | Completed |
| Murujuga archaeological excavation, collection and sampling, Dampier Archipelago, WA | 2014/7160 | Not Controlled Action | Completed |
| North Rankin B gas compression facility | 2005/2500 | Not Controlled Action | Completed |
| P30 Hydrocarbon Exploration Well | 2001/293 | Not Controlled Action | Completed |
| Pipeline System Modifications Project | 2000/3 | Not Controlled Action | Completed |
| Port Expansion and Dredging | 2003/1265 | Not Controlled Action | Completed |
| Port Hedland Channel Risk and Optimisation Project, WA | 2017/7915 | Not Controlled Action | Completed |
| Project Highclere Geophysical Survey | 2021/9023 | Not Controlled Action | Completed |
| Searipple gas and condensate field development | 2000/89 | Not Controlled Action | Completed |
| Spool Base Facility | 2001/263 | Not Controlled Action | Completed |
| Subsea Gas Pipeline From Stybarrow Field to Griffin Venture Gas Export Pipeline | 2005/2033 | Not Controlled Action | Completed |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action | | | |
| sub-sea tieback of Perseus field wells | 2004/1326 | Not Controlled Action | Completed |
| Telstra North Rankin Spur Fibre Optic Cable | 2016/7836 | Not Controlled Action | Completed |
| Thevenard Island Retirement Project | 2015/7423 | Not Controlled Action | Completed |
| To construct and operate an offshore submarine fibre optic cable, WA | 2014/7373 | Not Controlled Action | Completed |
| WA-295-P Kerr-McGee Exploration Wells | 2001/152 | Not Controlled Action | Completed |
| Wanda Offshore Research Project, 80 km north-east of Exmouth, WA | 2018/8293 | Not Controlled Action | Completed |
| Western Flank Gas Development | 2005/2464 | Not Controlled Action | Completed |
| Wheatstone 3D seismic survey, 70km north of Barrow Island | 2004/1761 | Not Controlled Action | Completed |
| Not controlled action (particular manner) | | | |
| 'Kate' 3D marine seismic survey, exploration permits WA-320-P and WA-345-P, 60km | 2005/2037 | Not Controlled Action (Particular Manner) | Post-Approval |
| 'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32 | 2005/2282 | Not Controlled Action (Particular Manner) | Post-Approval |
| "Leanne" offshore 3D seismic exploration, WA-356-P | 2005/1938 | Not Controlled Action (Particular Manner) | Post-Approval |
| 2D and 3D seismic surveys | 2005/2151 | Not Controlled Action (Particular Manner) | Post-Approval |
| 2D marine seismic survey | 2012/6296 | Not Controlled Action (Particular Manner) | Post-Approval |
| 2D seismic survey | 2008/4493 | Not Controlled Action (Particular Manner) | Post-Approval |
| 2D Seismic Survey | 2005/2146 | Not Controlled Action | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | (Particular Manner) | |
| 2D seismic survey in permit areas WA-274P and WA-281P | 2004/1521 | Not Controlled Action (Particular Manner) | Post-Approval |
| 2D Seismic Survey Permit Area WA-352-P | 2008/4628 | Not Controlled Action (Particular Manner) | Post-Approval |
| 2D seismic survey within permit WA-291 | 2007/3265 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D marine seismic survey | 2008/4281 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D Marine Seismic Survey (WA-482-P, WA-363-P), WA | 2013/6761 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D Marine Seismic Survey in Permit Areas WA-15-R, WA-18-R, WA-205-P, WA-253-P, WA-267-P and WA-268-P | 2003/1271 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D Marine Seismic Survey in WA 457-P & WA 458-P, North West Shelf, offshore WA | 2013/6862 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D marine seismic Survey - Maxima 3D MSS | 2006/2945 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D marine seismic survey over petroleum title WA-268-P | 2007/3458 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D Marine Seismic Surveys - Contos CT-13 & Supertubes CT-13, offshore WA | 2013/6901 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D seismic survey | 2006/2715 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| 3D Seismic Survey, Browse Basin, WA | 2009/5048 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D Seismic Survey, near Scott Reef, Browse Basin | 2005/2126 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D Seismic Survey, WA | 2008/4428 | Not Controlled Action (Particular Manner) | Post-Approval |
| 3D sesmic survey | 2006/2781 | Not Controlled Action (Particular Manner) | Post-Approval |
| Acheron Non-Exclusive 2D Seismic Survey | 2008/4565 | Not Controlled Action (Particular Manner) | Post-Approval |
| Acheron Non-Exclusive 2D Seismic Survey | 2009/4968 | Not Controlled Action (Particular Manner) | Post-Approval |
| Agrippina 3D Seismic Marine Survey | 2009/5212 | Not Controlled Action (Particular Manner) | Post-Approval |
| Apache Northwest Shelf Van Gogh Field Appraisal Drilling Program | 2007/3495 | Not Controlled Action (Particular Manner) | Post-Approval |
| Aperio 3D Marine Seismic Survey, WA | 2012/6648 | Not Controlled Action (Particular Manner) | Post-Approval |
| Artemis-1 Drilling Program (WA-360-P) | 2010/5432 | Not Controlled Action (Particular Manner) | Post-Approval |
| Aurora MC3D Marine Seismic Survey | 2010/5510 | Not Controlled Action (Particular Manner) | Post-Approval |
| Australia to Singapore Fibre Optic Submarine Cable System | 2011/6127 | Not Controlled Action (Particular | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | Manner) | |
| Balnaves Condensate Field Development | 2011/6188 | Not Controlled Action (Particular Manner) | Post-Approval |
| Bonaventure 3D seismic survey | 2006/2514 | Not Controlled Action (Particular Manner) | Post-Approval |
| Cable Seismic Exploration Permit areas WA-323-P and WA-330-P | 2008/4227 | Not Controlled Action (Particular Manner) | Post-Approval |
| Cape Preston East - Iron Ore Export Facilities, Pilbara, WA | 2013/6844 | Not Controlled Action (Particular Manner) | Post-Approval |
| Caswell MC3D Marine Seismic Survey | 2012/6594 | Not Controlled Action (Particular Manner) | Post-Approval |
| Cerberus exploration drilling campaign, Carnarvon Basin, WA | 2016/7645 | Not Controlled Action (Particular Manner) | Post-Approval |
| CGGVERITAS 2010 2D Seismic Survey | 2010/5714 | Not Controlled Action (Particular Manner) | Post-Approval |
| Charon 3D Marine Seismic Survey | 2007/3477 | Not Controlled Action (Particular Manner) | Post-Approval |
| Conduct an exploration drilling campaign | 2011/5964 | Not Controlled Action (Particular Manner) | Post-Approval |
| Consturction & operation of the Varanus Island kitchen & mess cyclone refuge building, compression p | 2013/6952 | Not Controlled Action (Particular Manner) | Post-Approval |
| Coverack Marine Seismic Survey | 2001/399 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| Cue Seismic Survey within WA-359-P, WA-361-P and WA-360-P | 2007/3647 | Not Controlled Action (Particular Manner) | Post-Approval |
| CVG 3D Marine Seismic Survey | 2012/6654 | Not Controlled Action (Particular Manner) | Post-Approval |
| Decommissioning of the Legendre facilities | 2010/5681 | Not Controlled Action (Particular Manner) | Post-Approval |
| Deep Water Drilling Program | 2010/5532 | Not Controlled Action (Particular Manner) | Post-Approval |
| Demeter 3D Seismic Survey, off Dampier, WA | 2002/900 | Not Controlled Action (Particular Manner) | Post-Approval |
| Diesel Fuel Bunker Operation | 2012/6289 | Not Controlled Action (Particular Manner) | Post-Approval |
| Draeck 3D Marine Seismic Survey, WA-205-P | 2006/3067 | Not Controlled Action (Particular Manner) | Post-Approval |
| Drilling 35-40 offshore exploration wells in deep water | 2008/4461 | Not Controlled Action (Particular Manner) | Post-Approval |
| Earthworks for kitchen/mess, cyclone refuge building & Compression Plant, Varanus Island | 2013/6900 | Not Controlled Action (Particular Manner) | Post-Approval |
| Eendracht Multi-Client 3D Marine Seismic Survey | 2009/4749 | Not Controlled Action (Particular Manner) | Post-Approval |
| Effect of marine seismic sounds to demersal fish and pearl oysters, north-west WA | 2018/8169 | Not Controlled Action (Particular Manner) | Post-Approval |
| Endurance 3D Marine Seismic Data Acquisition Survey | 2007/3667 | Not Controlled Action (Particular | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | Manner) | |
| Enfield M3 & Vincent 4D Marine Seismic Surveys | 2008/3981 | Not Controlled Action (Particular Manner) | Completed |
| Enfield M3 4D, Vincent 4D & 4D Line Test Marine Seismic Surveys | 2008/4122 | Not Controlled Action (Particular Manner) | Post-Approval |
| Enfield M4 4D Marine Seismic Survey | 2008/4558 | Not Controlled Action (Particular Manner) | Post-Approval |
| Enfield oilfield 3D Seismic Survey | 2006/3132 | Not Controlled Action (Particular Manner) | Post-Approval |
| Exmouth West 2D Marine Seismic Survey | 2008/4132 | Not Controlled Action (Particular Manner) | Post-Approval |
| Exploration Drilling Campaign | 2011/6047 | Not Controlled Action (Particular Manner) | Post-Approval |
| Exploration drilling of Zeus-1 well | 2008/4351 | Not Controlled Action (Particular Manner) | Post-Approval |
| Exploration Drilling Program - Permit areas - WA-314-P, WA-315-P, WA-398-P. | 2008/4064 | Not Controlled Action (Particular Manner) | Post-Approval |
| Fletcher-Finucane Development, WA26-L and WA191-P | 2011/6123 | Not Controlled Action (Particular Manner) | Post-Approval |
| Foxhound 3D Non-Exclusive Marine Seismic Survey | 2009/4703 | Not Controlled Action (Particular Manner) | Post-Approval |
| Gazelle 3D Marine Seismic Survey in WA-399-P and WA-42-L | 2010/5570 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| Geco Eagle 3D Marine Seismic Survey | 2008/3958 | Not Controlled Action (Particular Manner) | Post-Approval |
| Geoscience Australia - Marine survey in Browse Basin to acquire data to assist assessment of CO2 sto | 2013/6747 | Not Controlled Action (Particular Manner) | Post-Approval |
| Gicea 3D Marine Seismic Survey | 2008/4389 | Not Controlled Action (Particular Manner) | Post-Approval |
| Gigas 2D Pilot Ocean Bottom Cable Marine Seismic Survey | 2007/3839 | Not Controlled Action (Particular Manner) | Post-Approval |
| Glencoe 3D Marine Seismic Survey WA-390-P | 2007/3684 | Not Controlled Action (Particular Manner) | Post-Approval |
| Greater Western Flank Phase 1 gas Development | 2011/5980 | Not Controlled Action (Particular Manner) | Post-Approval |
| Grimalkin 3D Seismic Survey | 2008/4523 | Not Controlled Action (Particular Manner) | Post-Approval |
| Guacamole 2D Marine Seismic Survey | 2008/4381 | Not Controlled Action (Particular Manner) | Post-Approval |
| Harmony 3D Marine Seismic Survey | 2012/6699 | Not Controlled Action (Particular Manner) | Post-Approval |
| Harpy 1 exploration well | 2001/183 | Not Controlled Action (Particular Manner) | Post-Approval |
| Honeycombs MC3D Marine Seismic Survey | 2012/6368 | Not Controlled Action (Particular Manner) | Post-Approval |
| Huzzas MC3D Marine Seismic Survey (HZ-13) Carnarvon Basin, offshore WA | 2013/7003 | Not Controlled Action (Particular | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | Manner) | |
| Huzzas phase 2 marine seismic survey, Exmouth Plateau, Northern Carnarvon Basin, WA | 2013/7093 | Not Controlled Action (Particular Manner) | Post-Approval |
| Ichthys 3D Marine Seismic Survey | 2010/5550 | Not Controlled Action (Particular Manner) | Post-Approval |
| INDIGO Marine Cable Route Survey (INDIGO) | 2017/7996 | Not Controlled Action (Particular Manner) | Post-Approval |
| John Ross & Rosella Off Bottom Cable Seismic Exploration Program | 2008/3966 | Not Controlled Action (Particular Manner) | Post-Approval |
| Judo Marine 3D Seismic Survey within and adjacent to WA-412-P | 2008/4630 | Not Controlled Action (Particular Manner) | Post-Approval |
| Judo Marine 3D Seismic Survey within and adjacent to WA-412-P | 2009/4801 | Not Controlled Action (Particular Manner) | Post-Approval |
| Julimar Brunello Gas Development Project | 2011/5936 | Not Controlled Action (Particular Manner) | Post-Approval |
| Kingtree & Ironstone-1 Exploration Wells | 2011/5935 | Not Controlled Action (Particular Manner) | Post-Approval |
| Klimt 2D Marine Seismic Survey | 2007/3856 | Not Controlled Action (Particular Manner) | Post-Approval |
| Koolama 2D Seismic Survey Dampier Basin | 2010/5420 | Not Controlled Action (Particular Manner) | Post-Approval |
| Kraken, Lusca & Asperus 3D Marine Seismic Survey | 2013/6730 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| Laverda 3D Marine Seismic Survey and Vincent M1 4D Marine Seismic Survey | 2010/5415 | Not Controlled Action (Particular Manner) | Post-Approval |
| Laying a submarine optical fibre telecommunications cable, Perth to Singapore and Jakarta | 2014/7332 | Not Controlled Action (Particular Manner) | Post-Approval |
| Leopard 2D marine seismic survey | 2005/2290 | Not Controlled Action (Particular Manner) | Post-Approval |
| Lion 2D Marine Seismic Survey | 2007/3777 | Not Controlled Action (Particular Manner) | Post-Approval |
| Macedon Gas Field Development | 2008/4605 | Not Controlled Action (Particular Manner) | Post-Approval |
| Marine Geotechnical Drilling Program | 2008/4012 | Not Controlled Action (Particular Manner) | Post-Approval |
| Marine reconnaissance survey | 2008/4466 | Not Controlled Action (Particular Manner) | Post-Approval |
| Mariner Non-Exclusive 2D Seismic Survey | 2011/6172 | Not Controlled Action (Particular Manner) | Post-Approval |
| Millstream 20GL Pipeline, Bungaroo, Borefield Integration | 2012/6379 | Not Controlled Action (Particular Manner) | Post-Approval |
| Moosehead 2D seismic survey within permit WA-192-P | 2005/2167 | Not Controlled Action (Particular Manner) | Post-Approval |
| Munmorah 2D seismic survey within permits WA-308/9-P | 2003/970 | Not Controlled Action (Particular Manner) | Post-Approval |
| Ocean Bottom Cable Seismic Program, WA-264-P | 2007/3844 | Not Controlled Action (Particular | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | Manner) | |
| Ocean Bottom Cable Seismic Survey | 2005/2017 | Not Controlled Action (Particular Manner) | Post-Approval |
| Offshore Canning Multi Client 2D Marine Seismic Survey | 2010/5393 | Not Controlled Action (Particular Manner) | Post-Approval |
| Offshore Drilling Campaign | 2011/5830 | Not Controlled Action (Particular Manner) | Post-Approval |
| Offshore Fibre Optic Cable Network Construction & Operation, Port Hedland WA to Darwin NT | 2014/7223 | Not Controlled Action (Particular Manner) | Post-Approval |
| Offshore Gas Exploration Drilling Campaign | 2012/6384 | Not Controlled Action (Particular Manner) | Post-Approval |
| Orcus 3D Marine Seismic Survey in WA-450-P | 2010/5723 | Not Controlled Action (Particular Manner) | Post-Approval |
| Osprey and Dionysus Marine Seismic Survey | 2011/6215 | Not Controlled Action (Particular Manner) | Post-Approval |
| Outer Canning exploration drilling program off NW coast of WA | 2012/6618 | Not Controlled Action (Particular Manner) | Post-Approval |
| Palta-1 exploration well in Petroleum Permit Area WA-384-P | 2011/5871 | Not Controlled Action (Particular Manner) | Post-Approval |
| Phoenix 3D Seismic Survey, Bedout Sub-Basin | 2010/5360 | Not Controlled Action (Particular Manner) | Post-Approval |
| Pilot Appraisal Well - Torosa South 1 | 2008/3991 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| Pomodoro 3D Marine Seismic Survey in WA-426-P and WA-427-P | 2010/5472 | Not Controlled Action (Particular Manner) | Post-Approval |
| Port Headland Outer Harbour Pre-construction Pilling program | 2012/6341 | Not Controlled Action (Particular Manner) | Post-Approval |
| Port of Port Hedland channel marker replacement project, WA | 2017/8010 | Not Controlled Action (Particular Manner) | Post-Approval |
| Port Walcott upgrade, dredging & spoil disposal, & channel realignment | 2006/2806 | Not Controlled Action (Particular Manner) | Post-Approval |
| Pyrenees 4D Marine Seismic Monitor Survey, HCA12A | 2012/6579 | Not Controlled Action (Particular Manner) | Post-Approval |
| Pyrenees-Macedon 3D marine seismic survey | 2005/2325 | Not Controlled Action (Particular Manner) | Post-Approval |
| Quiberon 2D Seismic Survey, permit area WA-385P, offshore of Carnarvon | 2009/5077 | Not Controlled Action (Particular Manner) | Post-Approval |
| Reindeer gas reservior development, Devil Creek, Carnarvon Basin - WA | 2007/3917 | Not Controlled Action (Particular Manner) | Post-Approval |
| Repsol 3d & 2D Marine Seismic Survey | 2012/6658 | Not Controlled Action (Particular Manner) | Post-Approval |
| Rose 3D Seismic Program | 2008/4239 | Not Controlled Action (Particular Manner) | Post-Approval |
| Rosebud 3D Marine Seismic Survey in WA-30-R and TR/5 | 2012/6493 | Not Controlled Action (Particular Manner) | Post-Approval |
| Rydal-1 Petroleum Exploration Well, WA | 2012/6522 | Not Controlled Action (Particular | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | Manner) | |
| Salsa 3D Marine Seismic Survey | 2010/5629 | Not Controlled Action (Particular Manner) | Post-Approval |
| Santos Winchester three dimensional seismic survey - WA-323-P & WA-330-P | 2011/6107 | Not Controlled Action (Particular Manner) | Post-Approval |
| Scarborough Development nearshore component, NWS, WA | 2018/8362 | Not Controlled Action (Particular Manner) | Post-Approval |
| Schild MC3D Marine Seismic Survey | 2012/6373 | Not Controlled Action (Particular Manner) | Post-Approval |
| Schild Phase 11 MC3D Marine Seismic Survey, Browse Basin | 2013/6894 | Not Controlled Action (Particular Manner) | Post-Approval |
| Scott Reef Seismic Research | 2006/2647 | Not Controlled Action (Particular Manner) | Post-Approval |
| Skorpion Marine Seismic Survey WA | 2001/416 | Not Controlled Action (Particular Manner) | Post-Approval |
| Sovereign 3D Marine Seismic Survey | 2011/5861 | Not Controlled Action (Particular Manner) | Post-Approval |
| Stag 4D & Reindeer MAZ Marine Seismic Surveys, WA | 2013/7080 | Not Controlled Action (Particular Manner) | Post-Approval |
| Stag Off-bottom Cable Seismic Survey | 2007/3696 | Not Controlled Action (Particular Manner) | Post-Approval |
| Stybarrow 4D Marine Seismic Survey | 2011/5810 | Not Controlled Action (Particular Manner) | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| Stybarrow Baseline 4D marine seismic survey | 2008/4530 | Not Controlled Action (Particular Manner) | Post-Approval |
| Tantabiddi Boat Ramp Sand Bypassing | 2015/7411 | Not Controlled Action (Particular Manner) | Post-Approval |
| Tidepole Maz 3D Seismic Survey Campaign | 2007/3706 | Not Controlled Action (Particular Manner) | Post-Approval |
| Torosa-5 Apraisal Well, WA-30-R | 2008/4430 | Not Controlled Action (Particular Manner) | Post-Approval |
| Tortilla 2D Seismic Survey, WA | 2011/6110 | Not Controlled Action (Particular Manner) | Post-Approval |
| Tridacna 3D Ocean Bottom Cable Marine Seismic Survey | 2011/5959 | Not Controlled Action (Particular Manner) | Post-Approval |
| Triton 3D Marine Seismic Survey, WA-2-R and WA-3-R | 2006/2609 | Not Controlled Action (Particular Manner) | Post-Approval |
| Undertake a 3D marine seismic survey | 2010/5695 | Not Controlled Action (Particular Manner) | Post-Approval |
| Undertake a three dimensional marine seismic survey | 2010/5679 | Not Controlled Action (Particular Manner) | Post-Approval |
| Undertake a three dimensional marine seismic survey | 2010/5715 | Not Controlled Action (Particular Manner) | Post-Approval |
| Vampire 2D Non Exclusive Seismic Survey, WA | 2010/5543 | Not Controlled Action (Particular Manner) | Post-Approval |
| Veritas Voyager 2D Marine Seismic Survey | 2009/5151 | Not Controlled Action (Particular | Post-Approval |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Not controlled action (particular manner) | | | |
| | | Manner) | |
| Vincent M1 and Enfield M5 4D Marine Seismic Survey | 2010/5720 | Not Controlled Action (Particular Manner) | Post-Approval |
| Warramunga Non-Inclusive 3D Seismic Survey | 2008/4553 | Not Controlled Action (Particular Manner) | Post-Approval |
| West Anchor 3D Marine Seismic Survey | 2008/4507 | Not Controlled Action (Particular Manner) | Post-Approval |
| West Panaeus 3D seismic survey | 2006/3141 | Not Controlled Action (Particular Manner) | Post-Approval |
| Westralia SPAN Marine Seismic Survey, WA & NT | 2012/6463 | Not Controlled Action (Particular Manner) | Post-Approval |
| Wheatstone 3D MAZ Marine Seismic Survey | 2011/6058 | Not Controlled Action (Particular Manner) | Post-Approval |
| Wheatstone Iago Appraisal Well Drilling | 2007/3941 | Not Controlled Action (Particular Manner) | Post-Approval |
| Wheatstone Iago Appraisal Well Drilling | 2008/4134 | Not Controlled Action (Particular Manner) | Post-Approval |
| Woodside Southern Browse 3D Seismic Survey, WA | 2007/3534 | Not Controlled Action (Particular Manner) | Post-Approval |
| Zeemeermin MC3D seismic survey, Browse Basin, Offshore WA | 2009/5023 | Not Controlled Action (Particular Manner) | Post-Approval |
| Referral decision | | | |
| 3D Marine Seismic Survey in the offshore northwest Carnarvon Basin | 2011/6175 | Referral Decision | Completed |

| Title of referral | Reference | Referral Outcome | Assessment Status |
|---|---|---|---|
| Referral decision | | | |
| 3D Seismic Survey | 2008/4219 | Referral Decision | Completed |
| Aurora extension MC3D Marine Seismic Survey | 2011/5887 | Referral Decision | Completed |
| Bianchi 3D Marine Seismic Survey, Carnavon Basin, WA | 2013/7078 | Referral Decision | Completed |
| BRSN08 3D Marine Seismic Survey | 2008/4582 | Referral Decision | Completed |
| CVG 3D Marine Seismic Survey | 2012/6270 | Referral Decision | Completed |
| Enfield 4D Marine Seismic Surveys, Production Permit WA-28-L | 2005/2370 | Referral Decision | Completed |
| Experimental Study of Behavioural and Physiological Impact on Fish of Seismic Ex | 2006/2625 | Referral Decision | Completed |
| Outer Harbour Development and associated marine and terrestial infrastructure | 2008/4148 | Referral Decision | Completed |
| Pilot Appraisal Well - Torosa South-1 | 2008/3985 | Referral Decision | Completed |
| Rose 3D Seismic acquisition survey | 2008/4220 | Referral Decision | Completed |
| Seismic Data Acquisition, Browse Basin | 2010/5475 | Referral Decision | Completed |
| Stybarrow Baseline 4D Marine Seismic Survey (Permit Areas WA-255-P, WA-32-L, WA- | 2008/4165 | Referral Decision | Completed |
| Two Dimensional Transition Zone Seismic Survey - TP/7 (R1) | 2010/5507 | Referral Decision | Completed |
| Varanus Island Compression Project | 2012/6698 | Referral Decision | Completed |

## Key Ecological Features [ 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 Argo Abyssal Plain with the Scott Plateau | North-west |

| Name | Region |
|---|---|
| Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula | North-west |
| Commonwealth waters adjacent to Ningaloo Reef | North-west |
| Continental Slope Demersal Fish Communities | North-west |
| Exmouth Plateau | North-west |
| Glomar Shoals | North-west |
| Mermaid Reef and Commonwealth waters surrounding Rowley Shoals | North-west |
| Seringapatam Reef and Commonwealth waters in the Scott Reef Complex | North-west |
| Western demersal slope and associated fish communities | South-west |

| Biologically Important Areas | | [ Resource Information ] |
|---|---|---|
| Scientific Name | Behaviour | Presence |
| Dugong | | |
| Dugong dugon<br>Dugong [28] | Breeding | Known to occur |
| Dugong dugon<br>Dugong [28] | Calving | Known to occur |
| Dugong dugon<br>Dugong [28] | Foraging (high density seagrass beds) | Known to occur |
| Dugong dugon<br>Dugong [28] | Nursing | Known to occur |
| Marine Turtles | | |
| Caretta caretta<br>Loggerhead Turtle [1763] | Foraging | Known to occur |
| Caretta caretta<br>Loggerhead Turtle [1763] | Internesting buffer | Known to occur |
| Caretta caretta<br>Loggerhead Turtle [1763] | Nesting | Known to occur |

| Scientific Name | Behaviour | Presence |
|---|---|---|
| Chelonia mydas<br>Green Turtle [1765] | Aggregation | Known to occur |
| Chelonia mydas<br>Green Turtle [1765] | Basking | Known to occur |
| Chelonia mydas<br>Green Turtle [1765] | Foraging | Likely to occur |
| Chelonia mydas<br>Green Turtle [1765] | Foraging | Known to occur |
| Chelonia mydas<br>Green Turtle [1765] | Internesting | Likely to occur |
| Chelonia mydas<br>Green Turtle [1765] | Internesting | Known to occur |
| Chelonia mydas<br>Green Turtle [1765] | Internesting buffer | Known to occur |
| Chelonia mydas<br>Green Turtle [1765] | Mating | Known to occur |
| Chelonia mydas<br>Green Turtle [1765] | Migration corridor | Known to occur |
| Chelonia mydas<br>Green Turtle [1765] | Nesting | Known to occur |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Foraging | Likely to occur |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Foraging | Known to occur |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Internesting | Known to occur |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Internesting buffer | Known to occur |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Mating | Known to occur |

| Scientific Name | Behaviour | Presence |
|---|---|---|
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Migration corridor | Known to occur |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Nesting | Known to occur |
| Natator depressus<br>Flatback Turtle [59257] | Aggregation | Known to occur |
| Natator depressus<br>Flatback Turtle [59257] | Foraging | Known to occur |
| Natator depressus<br>Flatback Turtle [59257] | Internesting | Known to occur |
| Natator depressus<br>Flatback Turtle [59257] | Internesting buffer | Known to occur |
| Natator depressus<br>Flatback Turtle [59257] | Mating | Known to occur |
| Natator depressus<br>Flatback Turtle [59257] | Migration corridor | Known to occur |
| Natator depressus<br>Flatback Turtle [59257] | Nesting | Known to occur |
| **River shark** | | |
| Pristis clavata<br>Dwarf Sawfish [68447] | Foraging | Known to occur |
| Pristis clavata<br>Dwarf Sawfish [68447] | Nursing | Known to occur |
| Pristis clavata<br>Dwarf Sawfish [68447] | Pupping | Known to occur |
| Pristis pristis<br>Largetooth Sawfish [60756] | Foraging | Known to occur |
| Pristis pristis<br>Largetooth Sawfish [60756] | Pupping | Likely to occur |

| Scientific Name | Behaviour | Presence |
|---|---|---|
| Pristis zijsron<br>Green Sawfish [68442] | Nursing | Known to occur |
| Pristis zijsron<br>Green Sawfish [68442] | Pupping | Known to occur |
| **Seabirds** | | |
| Ardenna pacifica<br>Wedge-tailed Shearwater [84292] | Foraging (in high numbers) | Known to occur |
| Ardenna tenuirostris<br>Short-tailed Shearwater [84292] | Breeding | Known to occur |
| Fregata ariel<br>Lesser Frigatebird [1012] | Breeding | Known to occur |
| Fregata minor<br>Greater Frigatebird [1013] | Breeding | Known to occur |
| Onychoprion anaethetus<br>Bridled Tern [82845] | Foraging (in high numbers) | Known to occur |
| Onychoprion fuscata<br>Sooty Tern [82847] | Foraging | Known to occur |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | Breeding | Known to occur |
| Sterna dougallii<br>Roseate Tern [817] | Breeding | Known to occur |
| Sternula albifrons sinensis<br>Little Tern [82850] | Breeding | Known to occur |
| Sternula albifrons sinensis<br>Little Tern [82850] | Resting | Known to occur |
| Sternula nereis<br>Fairy Tern [82949] | Breeding | Known to occur |

| Scientific Name | Behaviour | Presence |
|---|---|---|
| Sula leucogaster<br>Brown Booby [1022] | Breeding | Known to occur |
| Sula sula<br>Red-footed Booby [1023] | Breeding | Known to occur |
| Thalasseus bengalensis<br>Lesser Crested Tern [66546] | Breeding | Known to occur |
| **Sharks** | | |
| Rhincodon typus<br>Whale Shark [66680] | Foraging | Known to occur |
| Rhincodon typus<br>Whale Shark [66680] | Foraging (high density prey) | Known to occur |
| **Whales** | | |
| Balaenoptera musculus brevicauda<br>Pygmy Blue Whale [81317] | Foraging | Known to occur |
| Balaenoptera musculus brevicauda<br>Pygmy Blue Whale [81317] | Migration | Known to occur |
| Megaptera novaeangliae<br>Humpback Whale [38] | Calving | Known to occur |
| Megaptera novaeangliae<br>Humpback Whale [38] | Migration | Known to occur |
| Megaptera novaeangliae<br>Humpback Whale [38] | Migration (north and south) | Known to occur |
| Megaptera novaeangliae<br>Humpback Whale [38] | Nursing | Known to occur |
| Megaptera novaeangliae<br>Humpback Whale [38] | Resting | Known to occur |

# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

## 3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions when time permits.

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

# Acknowledgements

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

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

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

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

© Commonwealth of Australia
Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

# Appendix E Aboriginal Cultural Heritage Inquiry System Report for Hydrocarbon Spill EMBA

# ACHIS Lodges Sites - EMBA

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Lodged

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

### Search Criteria

66 Aboriginal Cultural Heritage (ACH) Lodged in Shapefile - SocioEconomic_EMBA

### Disclaimer

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific, or aesthetic importance within Aboriginal traditions, and provides an essential link for Aboriginal people to their past, present and future. In Western Australia Aboriginal heritage is protected under the *Aboriginal Heritage Act 1972*.

All Aboriginal cultural heritage in Western Australia is protected, whether or not the ACH has been reported or exists on the Register.

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 provide the details to the Department via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form and we will make every effort to rectify it as soon as possible.

### Copyright

Copyright in the information contained herein is and shall remain the property of the State of Western Australia. All rights reserved. This includes, but is not limited to, information from the Register established and maintained under the *Aboriginal Heritage Act 1972*.

Location information data licensed from Western Australian Land Information Authority (WALIA) trading as Landgate. Copyright in the location information data remains with WALIA. WALIA does not warrant the accuracy or completeness of the location information data or its suitability for any particular purpose.

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

## Terminology

ID: ACH on the Register is assigned a unique ID by the Department of Planning, Lands and Heritage using the format: ACH-00000001. For ACH on the former Register the ID numbers remain unchanged and use the new format. For example the ACH ID of the place Swan River was previously '3536' and is now 'ACH-00003536'.

Access and Restrictions:

- Boundary Reliable (Yes/No): Indicates whether to the best knowledge of the Department, the location and extent of the ACH boundary is considered reliable.
- Boundary Restricted = No: Represents the actual location of the ACH as understood by the Department..
- 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 ACH 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.
- Culturally Sensitive = No: Availability of information that the Department of Planning, Lands and Heritage holds in relation to the ACH is not restricted in any way.
- Culturally Sensitive = Yes: Some of the information that the Department of Planning, Lands and Heritage holds in relation to the ACH is restricted if it is considered culturally sensitive information. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the people who provided the information. To request access please contact via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form.
- Culturally Sensitive Nature:
  - No Gender / Initiation Restrictions: *Anyone* can view the information.
  - Men only: Only *males* can view restricted information.
  - Women only: Only *females* can view restricted information.

Status:

- Register: Aboriginal cultural heritage places that are assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972*.
- Lodged: Information which has been received in relation to an Aboriginal cultural heritage place, but is yet to be assessed under Section 5 of the *Aboriginal Heritage Act 1972.*
- Historic: Aboriginal heritage places assessed as not meeting the criteria of Section 5 of the *Aboriginal Heritage Act 1972*. Includes places that no longer exist as a result of land use activities with existing approvals.

Place Type: The type of Aboriginal cultural heritage place. For example an artefact scatter place or engravings place.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place.

## Coordinates

Map coordinates are based on the GDA 2020 Datum.

## Basemap Copyright

Map was created using ArcGIS software by Esri. ArcGIS and ArcMap are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved. For more information about Esri software, please visit www.esri.com.

Satellite, Hybrid, Road basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, HERE, DeLorme, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

Topographic basemap sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Lodged

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 883 | BARROW ISLAND 01 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 884 | I-24-S0001/S0002 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 885 | BARROW ISLAND 03 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 886 | C-21-S0001 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 887 | O-02-S0001 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 888 | P-05-S0001 | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 889 | O-06-S0001 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 890 | D-20-S0001 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 891 | Bandicoot Bay Settlement | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 892 | BARROW ISLAND 10 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 893 | D-20-S0002 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 894 | D-16-S0001 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 935 | ENDERBY IS.24: LIMESTONE | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Traditional Structure | *Registered Knowledge Holder names available from DPLH | |
| 976 | ROSEMARY IS.21: HALFWAY CK | No | No | No | No Gender / Initiation Restrictions | Lodged | Traditional Structure | *Registered Knowledge Holder names available from DPLH | |
| 1111 | LEGENDRE 08. | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Traditional Structure; Shell | *Registered Knowledge Holder names available from DPLH | |
| 6119 | PAP HILL 1. | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Rock Shelter | *Registered Knowledge Holder names available from DPLH | |
| 6120 | PAP HILL 2. | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Grinding areas / Grooves; Rock Shelter | *Registered Knowledge Holder names available from DPLH | |

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Lodged

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 6312 | EXMOUTH NORTH-EAST | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 6783 | 28 MILE CREEK NORTH 2 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | |
| 6786 | LAKESIDE COASTAL PLAIN | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | |
| 6789 | TURQUOISE BAY NORTH | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | |
| 7207 | NORWEGIAN BAY MIDDEN | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Midden | *Registered Knowledge Holder names available from DPLH | |
| 7208 | MILYERING ROCKS. | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Hunting Place | *Registered Knowledge Holder names available from DPLH | |
| 7302 | CAMP 17 CREEK ROCKSHELTERS | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 10099 | POINT MAUD, CORAL BAY | No | No | No | No Gender / Initiation Restrictions | Lodged | Burial | *Registered Knowledge Holder names available from DPLH | |
| 10624 | SEARIPPLE PASSAGE 1 | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | |
| 11651 | CHRISTINE BAY (DIXON IS.5). | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Shell | *Registered Knowledge Holder names available from DPLH | |
| 11655 | LIMESTONE PTF (DIXON IS.8) | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | |
| 11665 | EAST VALLEY 1 | No | No | No | No Gender / Initiation Restrictions | Lodged | Midden | *Registered Knowledge Holder names available from DPLH | |
| 11696 | DOLPHIN LOCATION 1 NO. 4 | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 11741 | NW CORNER BEACH 1 | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 11801 | COASTAL MIDDEN, 5 MILE | No | No | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | |
| 19171 | Ceremonial Ground | Yes | Yes | No | Men only | Lodged | Ritual / Ceremonial; Creation / Dreaming Narrative; Engraving | *Registered Knowledge Holder names available from DPLH | |
| 20621 | Bedout Island | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Creation / Dreaming Narrative; Landscape / Seascape Feature; Other | *Registered Knowledge Holder names available from DPLH | |

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Lodged

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 21499 | Dolphin Island RAMMC1 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Engraving | *Registered Knowledge Holder names available from DPLH | |
| 21500 | Gidley Island RAMMC2 | No | No | No | No Gender / Initiation Restrictions | Lodged | Engraving | *Registered Knowledge Holder names available from DPLH | |
| 21503 | Gidley Island RAMMC9 | No | No | No | No Gender / Initiation Restrictions | Lodged | Engraving | *Registered Knowledge Holder names available from DPLH | |
| 22943 | Flacourt Bay 01 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Rock Shelter | *Registered Knowledge Holder names available from DPLH | |
| 25076 | Norwegian Bay Burial 01/2008 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Burial | *Registered Knowledge Holder names available from DPLH | |
| 29549 | Boodie Soak | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 31762 | Site 1 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 31763 | Site 2 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36199 | Boodie Cave | No | Yes | No | | Lodged | Artefacts / Scatter; Rock Shelter | *Registered Knowledge Holder names available from DPLH | |
| 36200 | John Wayne Country Rockshelter | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter; Rock Shelter | *Registered Knowledge Holder names available from DPLH | |
| 36234 | South End structures, Barrow Island. | No | No | No | | Lodged | Historical; Traditional Structure | *Registered Knowledge Holder names available from DPLH | |
| 36261 | G-13-S0001 | No | Yes | No | | Lodged | Quarry | *Registered Knowledge Holder names available from DPLH | |
| 36262 | H-24-S0001 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36263 | H-24-S0002 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36264 | I-23-S0001 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36265 | I-23-S0002 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36266 | I-24-S0003 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Lodged

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

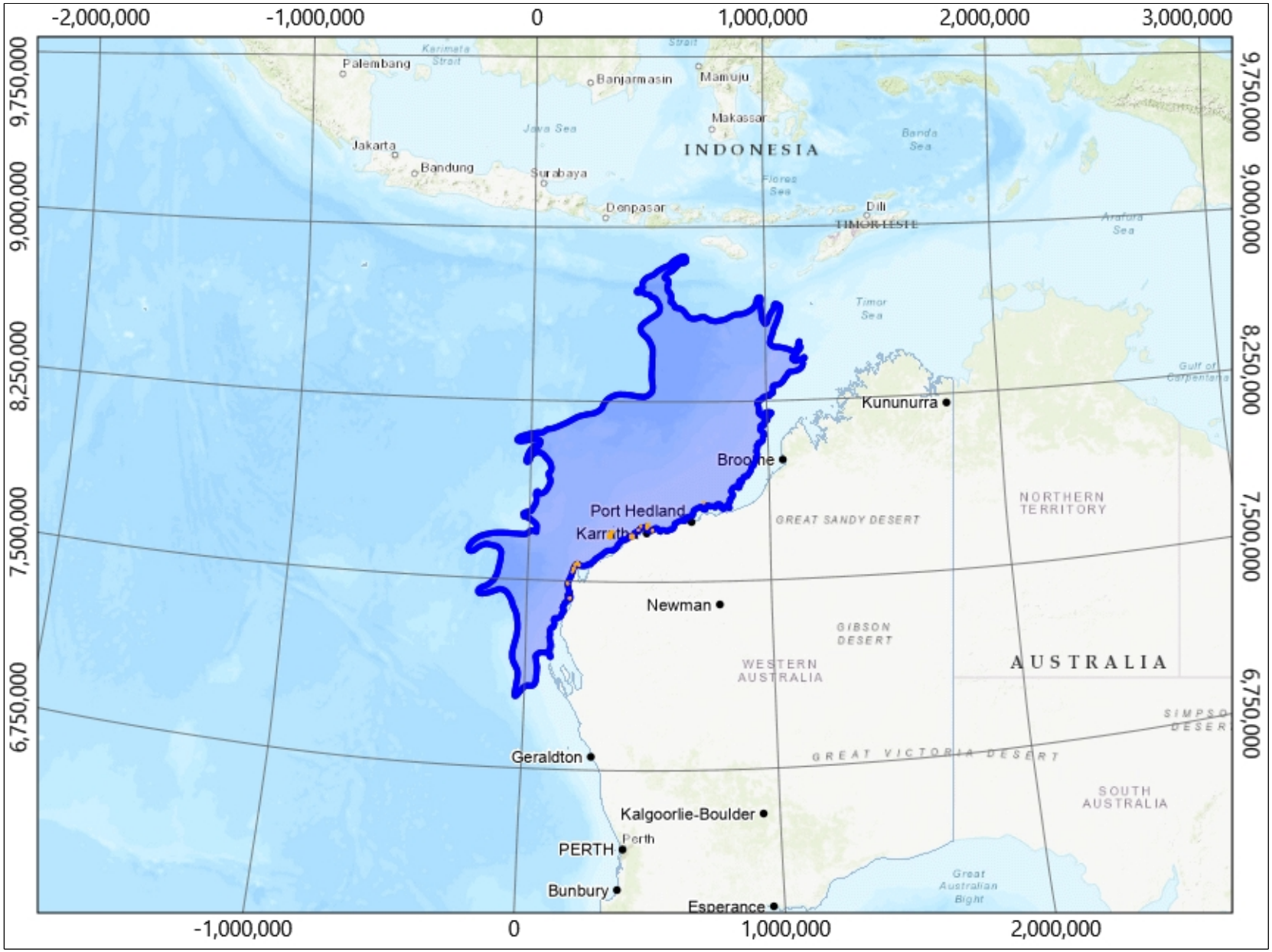
| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 36267 | J-23-S0001 | No | Yes | No | | Lodged | Grinding areas / Grooves | *Registered Knowledge Holder names available from DPLH | |
| 36268 | J-23-S0002 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36269 | J-23-S0003 | No | Yes | No | | Lodged | Modified Tree | *Registered Knowledge Holder names available from DPLH | |
| 36270 | M-03-S0001 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36271 | N-02-S0001 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36272 | O-02-S0002 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36273 | O-05-S0003 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36344 | N-05-S0002 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36345 | N-05-S0001 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36346 | O-05-S0001 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36347 | O-05-S0002 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36348 | P-04-S0001 | No | Yes | No | | Lodged | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 36718 | Skeleton Bay is the name of the landform in which the remains were found. | Yes | Yes | Yes | No Gender / Initiation Restrictions | Lodged | Burial | *Registered Knowledge Holder names available from DPLH | |
| 39730 | Tantabiddi Midden 1 | No | Yes | No | No Gender / Initiation Restrictions | Lodged | | *Registered Knowledge Holder names available from DPLH | |
| 40768 | Jurabi Point | Yes | | Yes | No Gender / Initiation Restrictions | Lodged | Burial | *Registered Knowledge Holder names available from DPLH | |

Department of Planning, Lands and Heritage

# Aboriginal Cultural Heritage Inquiry System

## Map of Aboriginal Cultural Heritage (ACH) Lodged

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use




### Legend

- Aboriginal Cultural Heritage (ACH) Lodged
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

846.02 kilometres

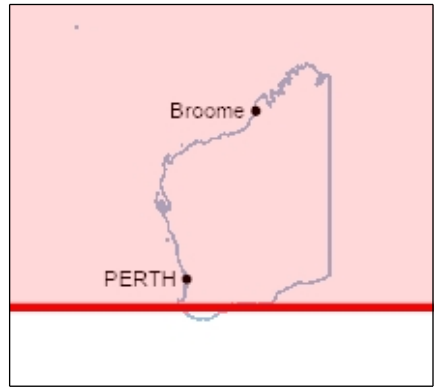
Map Scale 1 : 25,640,000

MGA Zone 50 (GDA2020)

Copyright for topographic map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Aerial Photos, Cadastre, Local Government Authority, Native Title boundary, Roads data copyright © Western Australian Land Information Authority (Landgate).

Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (Department of Mines, Industry Regulation and Safety).



# ACHIS Lodged Sites - All Operational Areas

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Lodged

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

### Search Criteria

No Aboriginal Cultural Heritage (ACH) Lodged in Shapefile - Ara_OpArea, Wallace_OpArea, Mestrel_OpArea, Curie_OpArea

### Disclaimer

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific, or aesthetic importance within Aboriginal traditions, and provides an essential link for Aboriginal people to their past, present and future. In Western Australia Aboriginal heritage is protected under the Aboriginal Heritage Act 1972.

All Aboriginal cultural heritage in Western Australia is protected, whether or not the ACH has been reported or exists on the Register.

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 provide the details to the Department via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form and we will make every effort to rectify it as soon as possible.

### Copyright

Copyright in the information contained herein is and shall remain the property of the State of Western Australia. All rights reserved. This includes, but is not limited to, information from the Register established and maintained under the Aboriginal Heritage Act 1972.

Location information data licensed from Western Australian Land Information Authority (WALIA) trading as Landgate. Copyright in the location information data remains with WALIA. WALIA does not warrant the accuracy or completeness of the location information data or its suitability for any particular purpose.

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

## Coordinates

Map coordinates are based on the GDA 2020 Datum.

## Basemap Copyright

Map was created using ArcGIS software by Esri. ArcGIS and ArcMap are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved. For more information about Esri software, please visit www.esri.com.

Satellite, Hybrid, Road basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, HERE, DeLorme, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

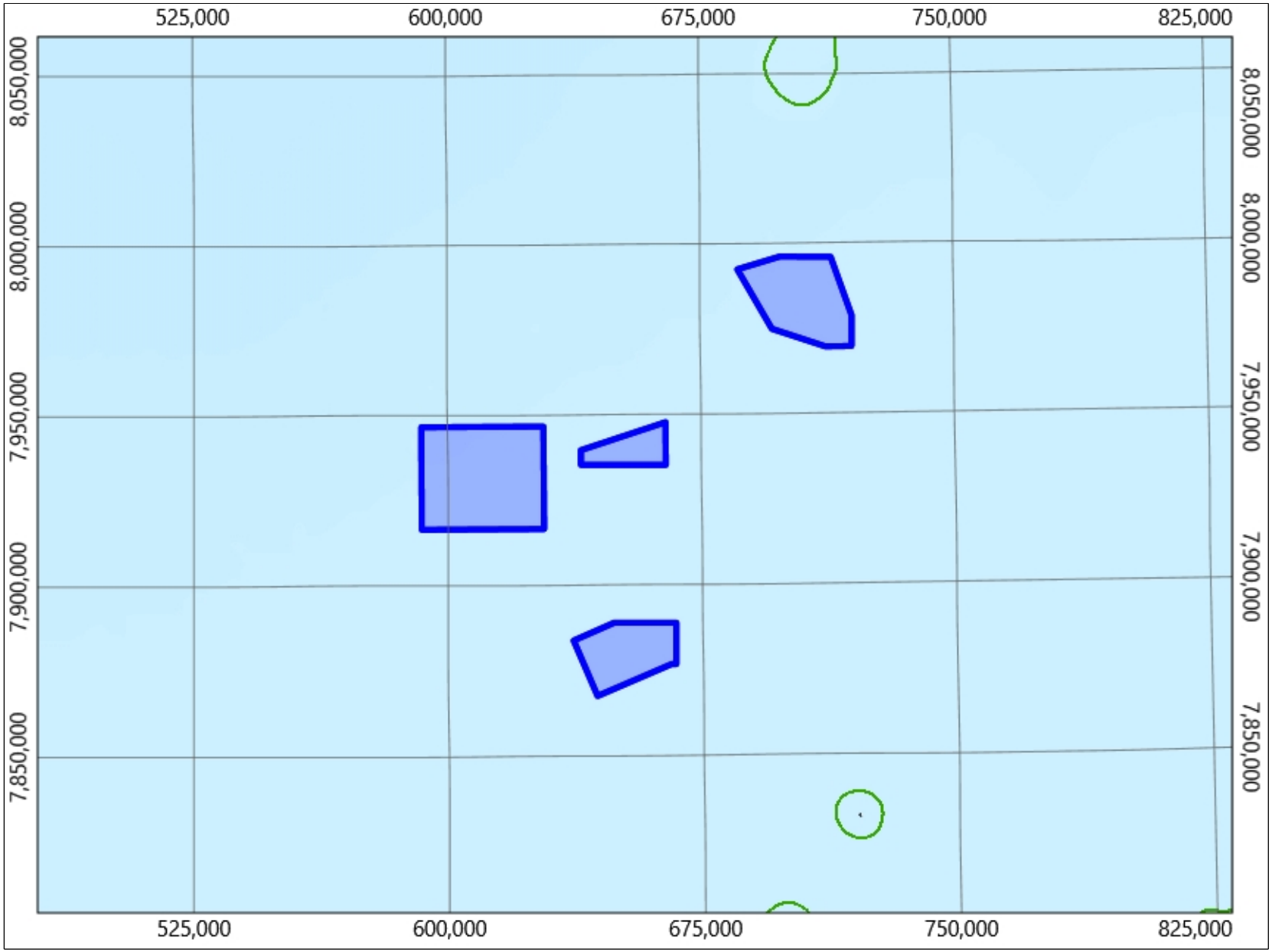
Topographic basemap sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.

Department of Planning, Lands and Heritage

# Aboriginal Cultural Heritage Inquiry System

## Map of Aboriginal Cultural Heritage (ACH) Lodged

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use




### Legend

- Aboriginal Cultural Heritage (ACH) Lodged
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

59.43 kilometres

Map Scale 1 : 1,800,000

MGA Zone 50 (GDA2020)

Copyright for topographic map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Aerial Photos, Cadastre, Local Government Authority, Native Title boundary, Roads data copyright © Western Australian Land Information Authority (Landgate).

Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (Department of Mines, Industry Regulation and Safety).



# ACHIS Registered Sites - EMBA

# Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

## Search Criteria

209 Aboriginal Cultural Heritage (ACH) Register in Shapefile - SocioEconomic_EMBA

### Disclaimer

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific, or aesthetic importance within Aboriginal traditions, and provides an essential link for Aboriginal people to their past, present and future. In Western Australia Aboriginal heritage is protected under the Aboriginal Heritage Act 1972.

All Aboriginal cultural heritage in Western Australia is protected, whether or not the ACH has been reported or exists on the Register.

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 provide the details to the Department via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form and we will make every effort to rectify it as soon as possible.

### Copyright

Copyright in the information contained herein is and shall remain the property of the State of Western Australia. All rights reserved. This includes, but is not limited to, information from the Register established and maintained under the Aboriginal Heritage Act 1972.

Location information data licensed from Western Australian Land Information Authority (WALIA) trading as Landgate. Copyright in the location information data remains with WALIA. WALIA does not warrant the accuracy or completeness of the location information data or its suitability for any particular purpose.

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

## Terminology

ID: ACH on the Register is assigned a unique ID by the Department of Planning, Lands and Heritage using the format: ACH-00000001. For ACH on the former Register the ID numbers remain unchanged and use the new format. For example the ACH ID of the place Swan River was previously '3536' and is now 'ACH-00003536'.

Access and Restrictions:

- Boundary Reliable (Yes/No): Indicates whether to the best knowledge of the Department, the location and extent of the ACH boundary is considered reliable.
- Boundary Restricted = No: Represents the actual location of the ACH as understood by the Department..
- 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 ACH 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.
- Culturally Sensitive = No: Availability of information that the Department of Planning, Lands and Heritage holds in relation to the ACH is not restricted in any way.
- Culturally Sensitive = Yes: Some of the information that the Department of Planning, Lands and Heritage holds in relation to the ACH is restricted if it is considered culturally sensitive information. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the people who provided the information. To request access please contact via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form.
- Culturally Sensitive Nature:
  - No Gender / Initiation Restrictions: Anyone can view the information.
  - Men only: Only males can view restricted information.
  - Women only: Only females can view restricted information.

Status:

- Register: Aboriginal cultural heritage places that are assessed as meeting Section 5 of the Aboriginal Heritage Act 1972.
- Lodged: Information which has been received in relation to an Aboriginal cultural heritage place, but is yet to be assessed under Section 5 of the Aboriginal Heritage Act 1972.
- Historic: Aboriginal heritage places assessed as not meeting the criteria of Section 5 of the Aboriginal Heritage Act 1972. Includes places that no longer exist as a result of land use activities with existing approvals.

Place Type: The type of Aboriginal cultural heritage place. For example an artefact scatter place or engravings place.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place.

## Coordinates

Map coordinates are based on the GDA 2020 Datum.

## Basemap Copyright

Map was created using ArcGIS software by Esri. ArcGIS and ArcMap are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved. For more information about Esri software, please visit www.esri.com.

Satellite, Hybrid, Road basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, HERE, DeLorme, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

Topographic basemap sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 508 | POINT MURAT 03 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07503 |
| 509 | POINT MURAT 04 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | P07504 |
| 563 | POINT MURAT 01 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07501 |
| 564 | POINT MURAT 02 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07502 |
| 628 | CAMP THIRTEEN BURIAL | No | Yes | No | No Gender / Initiation Restrictions | Register | Burial | *Registered Knowledge Holder names available from DPLH | P07434 |
| 873 | MONTEBELLO IS: NOALA CAVE. | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden; Rock Shelter | *Registered Knowledge Holder names available from DPLH | P07287 |
| 919 | ENDERBY IS.27: GOODWYN VIEW | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07279 |
| 926 | MONTEBELLO IS: HAYNES CAVE. | No | Yes | No | No Gender / Initiation Restrictions | Register | Sub surface cultural material; Artefacts / Scatter; Midden; Rock Shelter | *Registered Knowledge Holder names available from DPLH | P07286 |
| 932 | ENDERBY IS.21: BACK QUARRY | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Quarry | *Registered Knowledge Holder names available from DPLH | P07238 |
| 933 | ENDERBY IS.22: TEREBRALIA | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07239 |
| 934 | ENDERBY IS.23: GRINDING | No | No | No | No Gender / Initiation Restrictions | Register | Engraving; Grinding areas / Grooves | *Registered Knowledge Holder names available from DPLH | P07240 |
| 936 | ENDERBY IS.25: DINGHY MIDDEN | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07242 |
| 937 | ENDERBY IS.26: NORTH POINT | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden; Quarry | *Registered Knowledge Holder names available from DPLH | P07243 |
| 966 | ROSEMARY IS.11: CHOOKIE BAY | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07219 |
| 967 | ROSEMARY IS.12: CHOOKIE BAY | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Quarry | *Registered Knowledge Holder names available from DPLH | P07220 |
| 968 | ROSEMARY IS.13 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Grinding areas / Grooves; Midden | *Registered Knowledge Holder names available from DPLH | P07221 |
| 969 | ROSEMARY IS.14 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Grinding areas / Grooves; Midden | *Registered Knowledge Holder names available from DPLH | P07222 |

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 970 | ROSEMARY IS.15: AIRSTRIP | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Grinding areas / Grooves; Midden | *Registered Knowledge Holder names available from DPLH | P07223 |
| 971 | ROSEMARY IS.16: AIRSTRIP | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden; Quarry | *Registered Knowledge Holder names available from DPLH | P07224 |
| 972 | ROSEMARY IS.17: AIRSTRIP | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Quarry | *Registered Knowledge Holder names available from DPLH | P07225 |
| 973 | ROSEMARY IS.18: DEEP WATER | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07226 |
| 974 | ROSEMARY IS.19: CHITON | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07227 |
| 975 | ROSEMARY IS.20: HALFWAY CK | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07228 |
| 977 | ROSEMARY IS.22 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving; Traditional Structure | *Registered Knowledge Holder names available from DPLH | P07230 |
| 978 | ROSEMARY IS.23: WADJURU R/H | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving; Grinding areas / Grooves; Traditional Structure; Midden; Water Source | *Registered Knowledge Holder names available from DPLH | P07231 |
| 979 | ROSEMARY IS.24: HUNGERFORD | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07232 |
| 1062 | LEGENDRE 11 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | P07204 |
| 1103 | LEGENDRE HILL | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07193 |
| 1104 | LEGENDRE 01. | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Shell; Water Source | *Registered Knowledge Holder names available from DPLH | P07194 |
| 1105 | LEGENDRE 02 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07195 |
| 1106 | LEGENDRE 03. | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Shell | *Registered Knowledge Holder names available from DPLH | P07196 |
| 1109 | LEGENDRE 06. | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Shell | *Registered Knowledge Holder names available from DPLH | P07199 |
| 1110 | LEGENDRE 07. | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Shell | *Registered Knowledge Holder names available from DPLH | P07200 |
| 1112 | LEGENDRE 09. | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Shell | *Registered Knowledge Holder names available from DPLH | P07202 |

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 1113 | LEGENDRE 10. | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Rock Shelter; Shell | *Registered Knowledge Holder names available from DPLH | P07203 |
| 6017 | YARDIE CREEK CARAVAN BURIAL | No | No | No | No Gender / Initiation Restrictions | Register | Burial | *Registered Knowledge Holder names available from DPLH | P07115 |
| 6078 | ROSEMARY ISLAND 10 | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P07019 |
| 6187 | ANGEL ISLAND: NW. | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving; Grinding areas / Grooves; Midden; Rock Shelter | *Registered Knowledge Holder names available from DPLH | P06920 |
| 6227 | MALUS ISLAND. | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Camp; Engraving; Grinding areas / Grooves; Traditional Structure | *Registered Knowledge Holder names available from DPLH | P06908 |
| 6311 | POINT MURAT. | No | Yes | No | No Gender / Initiation Restrictions | Register | Burial; Artefacts / Scatter; Camp; Midden; Other | *Registered Knowledge Holder names available from DPLH | P06628 |
| 6616 | CORAL BAY ACCESS 2 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06361 |
| 6723 | MULANDA 2 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06257 |
| 6724 | MULANDA 3 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06258 |
| 6725 | MULANDA 4 | No | No | No | No Gender / Initiation Restrictions | Register | Midden | *Registered Knowledge Holder names available from DPLH | P06259 |
| 6754 | OSPREY BAY 6 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06165 |
| 6755 | OSPREY BAY INTERDUNAL 1 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06166 |
| 6756 | OSPREY BAY INTERDUNAL 2 | No | Yes | No | No Gender / Initiation Restrictions | Register | Midden | *Registered Knowledge Holder names available from DPLH | P06167 |
| 6757 | BLOODWOOD CREEK MIDDEN 1 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06168 |
| 6758 | BLOODWOOD CREEK MIDDEN 2 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06169 |
| 6759 | BLOODWOOD CREEK MIDDEN 3 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06170 |
| 6760 | BLOODWOOD CREEK SHORELINE | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06171 |

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 6761 | LOW POINT MIDDEN | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06172 |
| 6762 | MILYERING MIDDEN | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06173 |
| 6764 | CAMP 17 SOUTH MIDDENS | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06175 |
| 6765 | CAMP 17 NORTH MIDDENS | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06176 |
| 6769 | MULANDA 1 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06180 |
| 6782 | 28 MILE CREEK NORTH 1 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06140 |
| 6784 | MANDU MANDU CREEK SOUTH | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06142 |
| 6785 | MANDU MANDU CREEK NORTH | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06143 |
| 6790 | YARDIE CREEK SOUTH 1 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06148 |
| 6799 | YARDIE BEACH MIDDEN | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06157 |
| 6800 | OYSTER STACKS MIDDEN | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06158 |
| 6801 | NORTH T-BONE BAY | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06159 |
| 6802 | OSPREY BAY 1 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06160 |
| 6803 | OSPREY BAY 2 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06161 |
| 6804 | OSPREY BAY 3 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06162 |
| 6805 | OSPREY BAY 4 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06163 |
| 6806 | OSPREY BAY 5 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06164 |

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 6827 | CORAL BAY SKELETON | No | No | No | No Gender / Initiation Restrictions | Register | Burial | *Registered Knowledge Holder names available from DPLH | P06132 |
| 6833 | WEST MOORE ISLAND | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P06138 |
| 7126 | MESA CAMP | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P05792 |
| 7133 | ANGEL ISLAND BEACON | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P05799 |
| 7206 | WEALJUGOO MIDDEN. | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Camp; Hunting Place; Midden | *Registered Knowledge Holder names available from DPLH | P05710 |
| 7211 | MAUD LANDING. | No | No | No | No Gender / Initiation Restrictions | Register | Burial; Camp; Meeting Place; Water Source | *Registered Knowledge Holder names available from DPLH | P05715 |
| 7254 | SANDY BAY NORTH | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P05652 |
| 7265 | LAKE SIDE VIEW | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P05664 |
| 7299 | YARDIE CREEK | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P05645 |
| 7300 | MANDU MANDU CK ROCKSHELTERS | Yes | Yes | Yes | No Gender / Initiation Restrictions | Register | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | P05646 |
| 7303 | TULKI WELL MIDDEN | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P05649 |
| 7304 | PILGRAMUNNA BAY MIDDEN | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P05650 |
| 7305 | MANGROVE BAY. | No | Yes | No | No Gender / Initiation Restrictions | Register | Burial; Artefacts / Scatter; Hunting Place; Midden | *Registered Knowledge Holder names available from DPLH | P05651 |
| 7899 | MALUS ISLAND | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | P04947 |
| 7906 | DELAMBRE ISLAND SOUTH. | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Water Source | *Registered Knowledge Holder names available from DPLH | P04954 |
| 8301 | NINGALOO STATION | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | P04353 |
| 9735 | GIDLEY PASSAGE | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P02447 |

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 9737 | ENDERBY ISLAND 06: BOILER B | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving; Quarry | *Registered Knowledge Holder names available from DPLH | P02449 |
| 10381 | VLAMING HEAD | Yes | No | Yes | No Gender / Initiation Restrictions | Register | Ritual / Ceremonial; Creation / Dreaming Narrative | *Registered Knowledge Holder names available from DPLH | P01799 |
| 10578 | DAMPIER ARCHIPELAGO 04 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01576 |
| 10579 | DAMPIER ARCHIPELAGO 01. | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving; Grinding areas / Grooves; Midden; Water Source | *Registered Knowledge Holder names available from DPLH | P01577 |
| 10580 | DAMPIER ARCHIPELAGO 02 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01578 |
| 10581 | DAMPIER ARCHIPELAGO 03 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01579 |
| 10582 | DAMPIER ARCHIPELAGO | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01580 |
| 10583 | DAMPIER ARCHIPELAGO 06 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01581 |
| 10590 | DAMPIER ARCHIPELAGO 07 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01589 |
| 10591 | DAMPIER ARCHIPELAGO 08 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01590 |
| 10592 | DAMPIER ARCHIPELAGO 09 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01591 |
| 10593 | DAMPIER ARCHIPELAGO 10 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01592 |
| 10596 | DAMPIER ARCHIPELAGO 05 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P01595 |
| 10597 | DAMPIER ARCHIPELAGO 11 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving; Midden; Quarry | *Registered Knowledge Holder names available from DPLH | P01596 |
| 10625 | SEARIPPLE PASSAGE 2 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Traditional Structure | *Registered Knowledge Holder names available from DPLH | P01570 |
| 10626 | SEARIPPLE PASSAGE 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving; Traditional Structure | *Registered Knowledge Holder names available from DPLH | P01571 |
| 11328 | GAP WELL | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00836 |

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 11400 | YARDIE CREEK STATION | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00750 |
| 11401 | 5 Mile Well (Cape Range) | No | No | No | No Gender / Initiation Restrictions | Register | Sub surface cultural material; Artefacts / Scatter; Engraving; Painting; Quarry | *Registered Knowledge Holder names available from DPLH | P00751 |
| 11458 | NINGALOO (near) | No | No | No | No Gender / Initiation Restrictions | Register | Painting | *Registered Knowledge Holder names available from DPLH | P00701 |
| 11624 | HUNTERS POOL | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00541 |
| 11625 | DEPUCH ISLAND | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving; Other | *Registered Knowledge Holder names available from DPLH | P00542 |
| 11627 | JANE CREEK | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00544 |
| 11639 | DOLPHIN LOCATION 6 NO. 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00503 |
| 11640 | DOLPHIN LOCATION 6 NO. 1 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00504 |
| 11641 | DOLPHIN LOCATION 7 NO. 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00505 |
| 11642 | DOLPHIN LOCATION 7 NO. 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00506 |
| 11643 | DOLPHIN LOCATION 7 NO. 1 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00507 |
| 11644 | DOLPHIN ISLAND EMU | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00508 |
| 11645 | DOLPHIN LOCATION 8 NO. 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00509 |
| 11646 | DOLPHIN LOCATION 8 NO. 1 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00510 |
| 11647 | DOLPHIN LOCATION 8 NO. 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00511 |
| 11648 | DOLPHIN ISLAND | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00512 |
| 11649 | DEBBY'S DUNE (DIXON ISLAND 4) | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P00513 |

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 11650 | GAYLEEN BAY (DIXON IS. 6). | No | No | No | No Gender / Initiation Restrictions | Register | Sub surface cultural material; Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P00514 |
| 11656 | SUSAN BAY (DIXON ISLAND 7) | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P00520 |
| 11666 | EAST VALLEY 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00478 |
| 11667 | ENZOS LANDING | No | No | No | No Gender / Initiation Restrictions | Register | Engraving; Midden | *Registered Knowledge Holder names available from DPLH | P00479 |
| 11668 | DOLPHIN LOCATION 3 NO. 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving; Water Source | *Registered Knowledge Holder names available from DPLH | P00480 |
| 11669 | DOLPHIN LOCATION 3 NO. 4 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving; Water Source | *Registered Knowledge Holder names available from DPLH | P00481 |
| 11670 | DOLPHIN LOCATION 3 NO. 6 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving; Grinding areas / Grooves | *Registered Knowledge Holder names available from DPLH | P00482 |
| 11671 | DOLPHIN LOCATION 4 NO. 1 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00483 |
| 11672 | DOLPHIN LOCATION 4 NO. 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00484 |
| 11673 | DOLPHIN LOCATION 4 NO. 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00485 |
| 11674 | DOLPHIN LOCATION 5 NO. 5 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00486 |
| 11675 | DOLPHIN LOCATION 5 NO. 4 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00487 |
| 11676 | EAST VALLEY 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00488 |
| 11677 | NW CORNER POINT 5 (Sea Ripple Rock Art) | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00489 |
| 11678 | BOAT PASSAGE 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00490 |
| 11679 | BOAT PASSAGE 4 a | No | No | No | No Gender / Initiation Restrictions | Register | Engraving; Traditional Structure | *Registered Knowledge Holder names available from DPLH | P00491 |
| 11680 | BOAT PASSAGE 4 b | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00492 |

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 11681 | BOAT PASSAGE 5 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00493 |
| 11682 | BOAT PASSAGE 6 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00494 |
| 11683 | DOLPHIN LOCATION 5 NO. 1 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00495 |
| 11684 | DOLPHIN LOCATION 5 NO. 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00496 |
| 11685 | DOLPHIN LOCATION 5 NO. 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00497 |
| 11686 | TOZER ISLAND | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving; Fish Trap | *Registered Knowledge Holder names available from DPLH | P00498 |
| 11687 | DOLPHIN LOCATION 7 NO. 4 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00499 |
| 11688 | DOLPHIN LOCATION 7 NO. 5 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00500 |
| 11689 | BOAT PASSAGE 1 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00501 |
| 11690 | BOAT PASSAGE 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00502 |
| 11693 | SNAKE POINT, DOLPHIN ISLAND | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00452 |
| 11694 | DOLPHIN LOCATION 1 NO. 1 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00453 |
| 11695 | DOLPHIN LOCATION 1 NO. 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00454 |
| 11697 | DOLPHIN LOCATION 2 NO. 1 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P00456 |
| 11698 | ANGELA COVE | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving | *Registered Knowledge Holder names available from DPLH | P00457 |
| 11699 | GIDLEY BAY, GIDLEY ISLAND. | No | No | No | No Gender / Initiation Restrictions | Register | Camp; Engraving | *Registered Knowledge Holder names available from DPLH | P00458 |
| 11700 | NW CORNER POINT 1 | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00459 |

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 11701 | NW CORNER POINT 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00461 |
| 11702 | EAGLES NEST | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00462 |
| 11703 | DOLPHIN ISLAND SW 2a, b | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00463 |
| 11704 | THREE FISH SITE | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00464 |
| 11705 | DOLPHIN LOCATION 1 NO. 3 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00465 |
| 11706 | DOLPHIN ISLAND SW 1 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00466 |
| 11707 | DOLPHIN LOCATION 2 NO. 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00467 |
| 11708 | DOLPHIN LOCATION 3 NO. 1 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving | *Registered Knowledge Holder names available from DPLH | P00468 |
| 11709 | DOLPHIN LOCATION 3 NO. 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00469 |
| 11710 | DOLPHIN LOCATION 3 NO. 5 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00470 |
| 11711 | DOLPHIN ISLAND | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00471 |
| 11712 | MUSEUM BAY, DOLPHIN IS | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00472 |
| 11713 | LAST ENCOUNTER COVE. | No | No | No | No Gender / Initiation Restrictions | Register | Camp; Engraving | *Registered Knowledge Holder names available from DPLH | P00473 |
| 11714 | GIDLEY ISLAND | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00474 |
| 11715 | RIM ROCK GORGE. | No | No | No | No Gender / Initiation Restrictions | Register | Camp; Engraving | *Registered Knowledge Holder names available from DPLH | P00475 |
| 11716 | NW CORNER POINT 4 | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00476 |
| 11723 | DOLPHIN ISLAND | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00428 |

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 11725 | NW CORNER POINT 2 | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00430 |
| 11729 | NGARLUMA POINT, GIDLEY IS. | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving; Traditional Structure | *Registered Knowledge Holder names available from DPLH | P00434 |
| 11730 | MORS HILL, GIDLEY ISLAND. | No | No | No | No Gender / Initiation Restrictions | Register | Burial; Artefacts / Scatter; Engraving; Shell | *Registered Knowledge Holder names available from DPLH | P00435 |
| 11734 | ANGEL ISLAND 2 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00440 |
| 11735 | ANGEL ISLAND 1 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving | *Registered Knowledge Holder names available from DPLH | P00441 |
| 11740 | NW CORNER BEACH 3 | No | Yes | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00446 |
| 11767 | FISH POINT, GIDLEY ISLAND | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00418 |
| 11772 | ROSEMARY ISLAND 09 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P00369 |
| 11773 | ROSEMARY ISLAND 08 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving; Grinding areas / Grooves; Traditional Structure | *Registered Knowledge Holder names available from DPLH | P00370 |
| 11774 | ROSEMARY ISLAND 07 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00371 |
| 11775 | ROSEMARY ISLAND 06 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00372 |
| 11776 | ROSEMARY ISLAND 04. | No | No | No | No Gender / Initiation Restrictions | Register | Camp; Engraving | *Registered Knowledge Holder names available from DPLH | P00373 |
| 11777 | ROSEMARY ISLAND 03 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00374 |
| 11789 | ROSEMARY ISLAND 01 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving; Midden; Quarry | *Registered Knowledge Holder names available from DPLH | P00386 |
| 11818 | ROSEMARY ISLAND 02 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00362 |
| 11819 | ROSEMARY ISLAND 05 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00363 |
| 11820 | ENDERBY ISLAND 01 | No | No | No | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | P00364 |

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 11821 | ENDERBY ISLAND 02 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P00365 |
| 11823 | ENDERBY ISLAND 04 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving; Midden | *Registered Knowledge Holder names available from DPLH | P00367 |
| 11885 | PADJARI MANU CAVE (Formerly Bunbury Cave) | Yes | Yes | Yes | No Gender / Initiation Restrictions | Register | Sub surface cultural material; Artefacts / Scatter; Ritual / Ceremonial; Engraving; Painting; Water Source | *Registered Knowledge Holder names available from DPLH | P00267 |
| 15322 | POINT MURAT/WHITE OPAL | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | P07916 |
| 17193 | Ningaloo Station | No | No | No | No Gender / Initiation Restrictions | Register | Burial | *Registered Knowledge Holder names available from DPLH | |
| 17447 | PAP HILL OCHRE | No | Yes | No | No Gender / Initiation Restrictions | Register | Ritual / Ceremonial; Grinding areas / Grooves; Ochre; Rock Shelter | *Registered Knowledge Holder names available from DPLH | |
| 17448 | CHUGORI ROCKHOLE | No | Yes | No | No Gender / Initiation Restrictions | Register | Ritual / Ceremonial; Creation / Dreaming Narrative; Grinding areas / Grooves; Traditional Structure; Water Source | *Registered Knowledge Holder names available from DPLH | |
| 18822 | Cape Preston 19 | No | Yes | No | No Gender / Initiation Restrictions | Register | Quarry | *Registered Knowledge Holder names available from DPLH | |
| 18823 | Cape Preston 20 | No | Yes | No | No Gender / Initiation Restrictions | Register | Quarry | *Registered Knowledge Holder names available from DPLH | |
| 18824 | Cape Preston 21 | No | No | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Midden | *Registered Knowledge Holder names available from DPLH | |
| 18825 | Cape Preston 22 | No | Yes | No | No Gender / Initiation Restrictions | Register | Quarry | *Registered Knowledge Holder names available from DPLH | |
| 18826 | Cape Preston 23 | No | Yes | No | No Gender / Initiation Restrictions | Register | Quarry | *Registered Knowledge Holder names available from DPLH | |
| 18827 | Cape Preston 24 | No | Yes | No | No Gender / Initiation Restrictions | Register | Quarry | *Registered Knowledge Holder names available from DPLH | |
| 25853 | P08 - 01 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Shell | *Registered Knowledge Holder names available from DPLH | |
| 26006 | Site No. 25 | Yes | Yes | Yes | No Gender / Initiation Restrictions | Register | Engraving | *Registered Knowledge Holder names available from DPLH | |

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

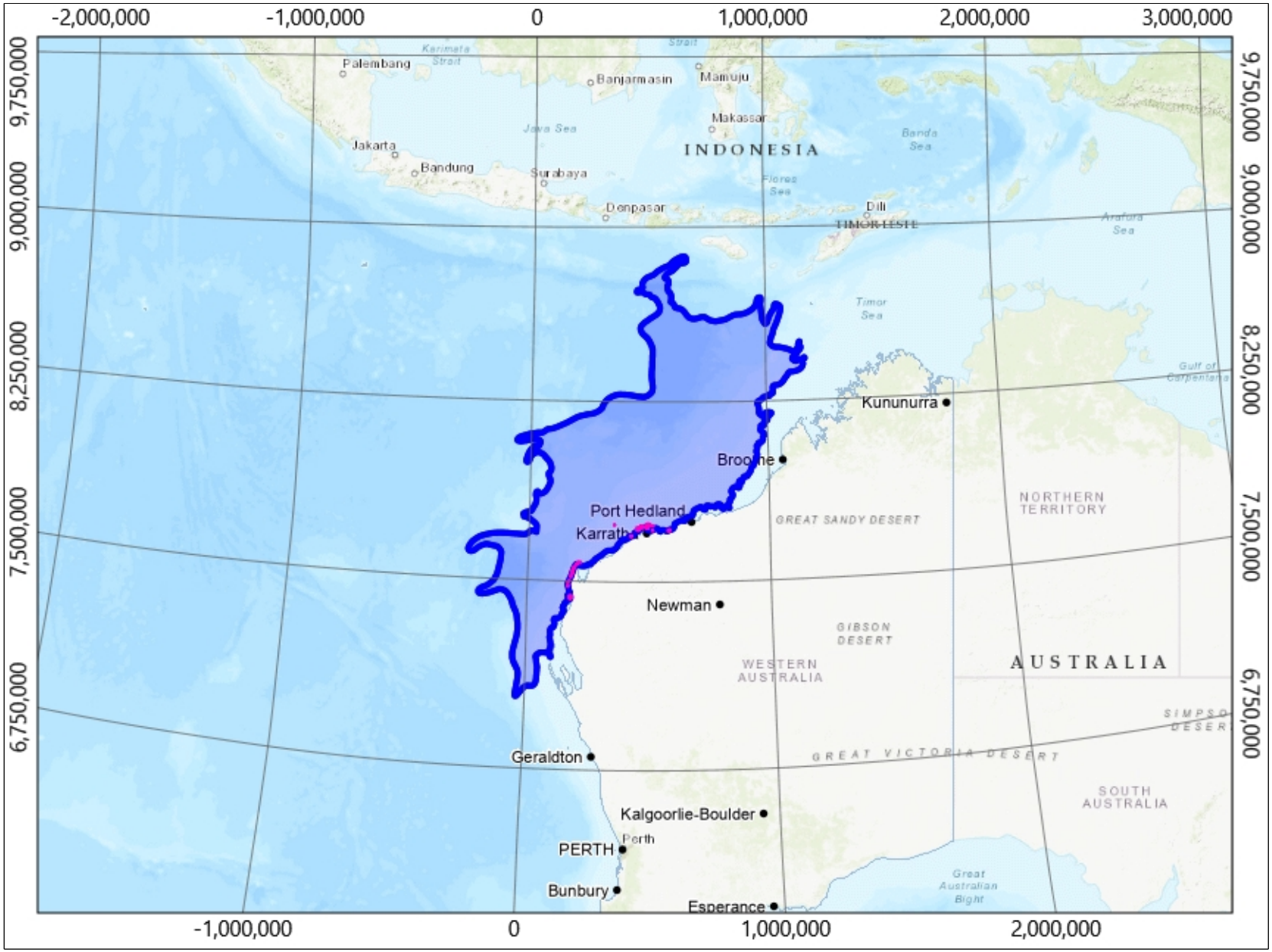
| ID | Name | Boundary Restricted | Boundary Reliable | Culturally Sensitive | Culturally Sensitive Nature | Status | Place Type | Knowledge Holders | Legacy ID |
|---|---|---|---|---|---|---|---|---|---|
| 26017 | P08 - 02 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving; Grinding areas / Grooves; Midden; Quarry; Shell | *Registered Knowledge Holder names available from DPLH | |
| 26444 | P09 - 04 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Quarry | *Registered Knowledge Holder names available from DPLH | |
| 26446 | P09 - 06 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Quarry | *Registered Knowledge Holder names available from DPLH | |
| 26453 | Burrup Peninsula V34 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter; Engraving; Grinding areas / Grooves; Shell | *Registered Knowledge Holder names available from DPLH | |
| 26736 | ACHM - 09-05 | No | Yes | No | No Gender / Initiation Restrictions | Register | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 38533 | Cape Bruguieres Channel | No | Yes | No | | Register | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |
| 38628 | Flying Foam Passage submerged freshwater spring | No | Yes | No | | Register | Artefacts / Scatter | *Registered Knowledge Holder names available from DPLH | |

Department of Planning, Lands and Heritage

# Aboriginal Cultural Heritage Inquiry System

## Map of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use




### Legend

- Aboriginal Cultural Heritage (ACH) Register
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

846.02 kilometres

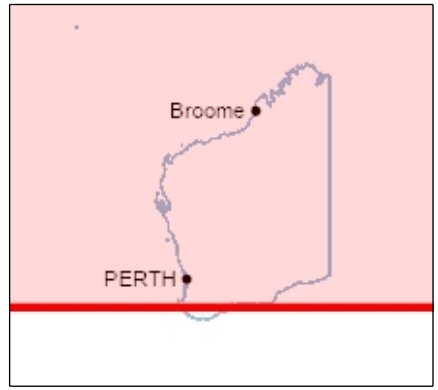
Map Scale 1 : 25,640,000

MGA Zone 50 (GDA2020)

Copyright for topographic map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Aerial Photos, Cadastre, Local Government Authority, Native Title boundary, Roads data copyright © Western Australian Land Information Authority (Landgate).

Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (Department of Mines, Industry Regulation and Safety).




© Government of Western Australia

Map created: 19/05/2025 1:41:12 PM by: GIS_NET_USER

Identifier: 1001039

# ACHIS Registered Sites - All Operational Areas

# Aboriginal Cultural Heritage Inquiry System

## List of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

### Search Criteria

No Aboriginal Cultural Heritage (ACH) Register in Shapefile - Ara_OpArea, Wallace_OpArea, Mestrel_OpArea, Curie_OpArea

### Disclaimer

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific, or aesthetic importance within Aboriginal traditions, and provides an essential link for Aboriginal people to their past, present and future. In Western Australia Aboriginal heritage is protected under the Aboriginal Heritage Act 1972.

All Aboriginal cultural heritage in Western Australia is protected, whether or not the ACH has been reported or exists on the Register.

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 provide the details to the Department via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form and we will make every effort to rectify it as soon as possible.

### Copyright

Copyright in the information contained herein is and shall remain the property of the State of Western Australia. All rights reserved. This includes, but is not limited to, information from the Register established and maintained under the Aboriginal Heritage Act 1972.

Location information data licensed from Western Australian Land Information Authority (WALIA) trading as Landgate. Copyright in the location information data remains with WALIA. WALIA does not warrant the accuracy or completeness of the location information data or its suitability for any particular purpose.

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use

## Coordinates

Map coordinates are based on the GDA 2020 Datum.

## Basemap Copyright

Map was created using ArcGIS software by Esri. ArcGIS and ArcMap are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved. For more information about Esri software, please visit www.esri.com.

Satellite, Hybrid, Road basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, HERE, DeLorme, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

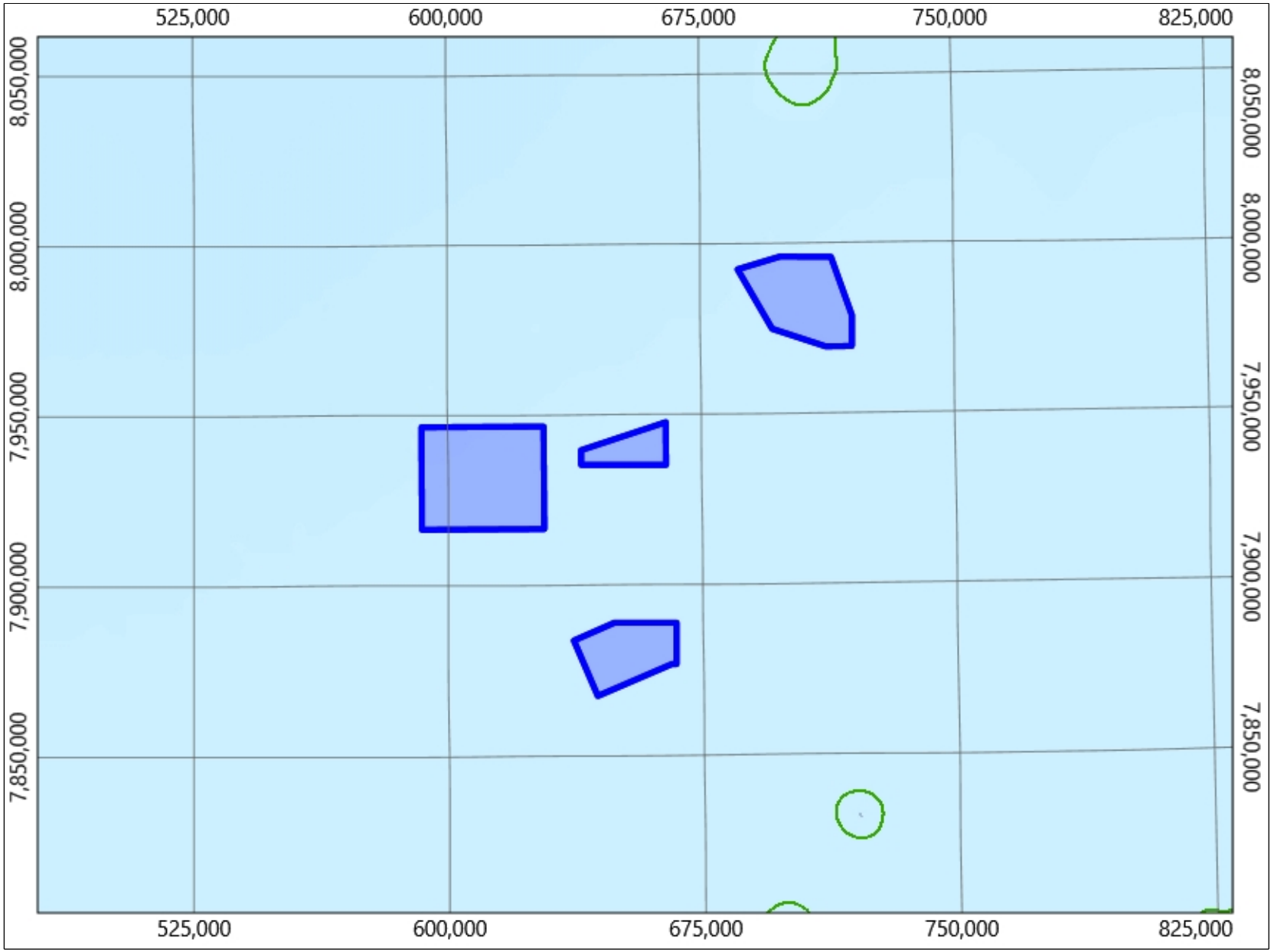
Topographic basemap sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.

Department of Planning, Lands and Heritage

# Aboriginal Cultural Heritage Inquiry System

## Map of Aboriginal Cultural Heritage (ACH) Register

For further important information on using this information please see the WA.gov.au website's Terms of Use at https://www.wa.gov.au/terms-of-use




### Legend

- Aboriginal Cultural Heritage (ACH) Register
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

59.43 kilometres

Map Scale 1 : 1,800,000

MGA Zone 50 (GDA2020)

Copyright for topographic map information shall at all times remain the property of the Commonwealth of Australia, Geoscience Australia - National Mapping Division. All rights reserved.

Aerial Photos, Cadastre, Local Government Authority, Native Title boundary, Roads data copyright © Western Australian Land Information Authority (Landgate).

Mining Tenement, Petroleum Application, Petroleum Title boundary data copyright © the State of Western Australia (Department of Mines, Industry Regulation and Safety).



# Appendix F Consultation

Santos

# APPENDIX F

## Contents


**Introduction** 2

**Campaign Emails** 4

Initial campaign email consultations 4

Reminder email consultations 9

**Fact sheets** 14

**Advertising** 15

**Presentation** 16

**Consultation Report** 17

# Introduction

This appendix summarises Santos' consultation effort for this EP, which has been conducted in accordance with NOPSEMA guidance to consult:

- Each Department or agency of the Commonwealth to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;
- Each Department or agency of a State or the Northern Territory to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;
- The Department of the responsible State Minister, or the responsible Northern Territory Minister;
- A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the environment plan, or the revision of the environment plan;
- Any other person or organisation that the titleholder considers relevant.

**Consultation information**

As described in Section 4 of this EP, a key aspect of Santos' consultation approach recognised, based on publicly available information and where Santos had first-hand knowledge through previous consultation activities, that the interests or activities of authorities, persons or organisations identified for consultation may be affected by:

- Impacts from planned activities and risks from unplanned events given their proximity to proposed activities (email type 1).
- Risks from unplanned events only given their significant distance from proposed activities (email type 2).

Further, based on publicly available information, the physical location of the interests or activities of some organisations may not be clear (email type 3).

As a result, Santos developed three consultation email types reflecting the above assessments, ensuring that email recipients were clear about why Santos was contacting them.

Bespoke emails were also provided to authorities, representative organisations and organisations with commercial fishing interests, similarly noting where fishers may be affected by proposed activities (email type 1a) and where fishers may be affected by activity risks only (email type 2b).

A list of all authorities, persons or organisations and their relevant email type is provided in this Appendix.

Other consultation materials presented in this Appendix are listed below:

- General fact sheet
- Commercial fishing fact sheet
- Print advertising
- Social media posts
- Consultation presentation to support face-to-face and online meetings

**Consultation report**

A summary of consultation with authorities, persons and organisations is included in this Appendix, comprising:

- A summary of objections, claims or other feedback provided by the authority, person or organisation;
- An assessment of merits where objections or claims were raised about adverse impacts and risks of the proposed activities;
- Santos' response statement; and
- Details of measures adopted, including the relevant EP reference.

# Campaign Emails

## Initial campaign email consultations

**Email Type 1 where authorities, persons and organisations may be affected by impacts from planned activities and risks from unplanned events given their proximity to proposed activities.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| 440 | 23/07/2025 | Sent | Campaign Email | General Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 1** CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |
| CON-440 - Organisations<br>Australian Border Force; Australian Conservation Foundation; Australian Hydrographic Office; Australian Marine Conservation Society; Australian Maritime Safety Authority - marine pollution; Care for Hedland Environmental Association; Conservation Council of WA; Department of Climate Change, Energy, the Environment and Water - Underwater cultural heritage; Greenpeace Australia Pacific; Kariyarra Aboriginal Corporation; Kimberley Land Council; Nyangumarta Karajarri Aboriginal Corporation; Nyaparu; Sea Shepherd Australia; Wanparta Aboriginal Corporation; Whale and Dolphin Conservation; Wilderness Society; World Wide Fund for Nature; Yamatji Marlpa Aboriginal Corporation | | | | | |

Outlook

# ![EXT]: CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Wed 23/07/2025 11:45
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

We are contacting you because Santos considers that you may have functions, interests or activities which may be affected by impacts from planned activities.

Information about planned activities, including a summary of Activity key impacts, risks and management measures is included in a Consultation Fact Sheet that can be accessed via this link to our Consultation Hub web site.

Information and maps are also included showing how we use sophisticated computer-based modelling to present the areas that could be affected in the unlikely event of a spill, noting that not all areas within the modelled Environment that May Be Affected (EMBA) would be affected at the same time.




## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities on your functions, interests or activities.
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please let us know if you would like any information you provide to us not to be published. If requested, Santos will ensure your information is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

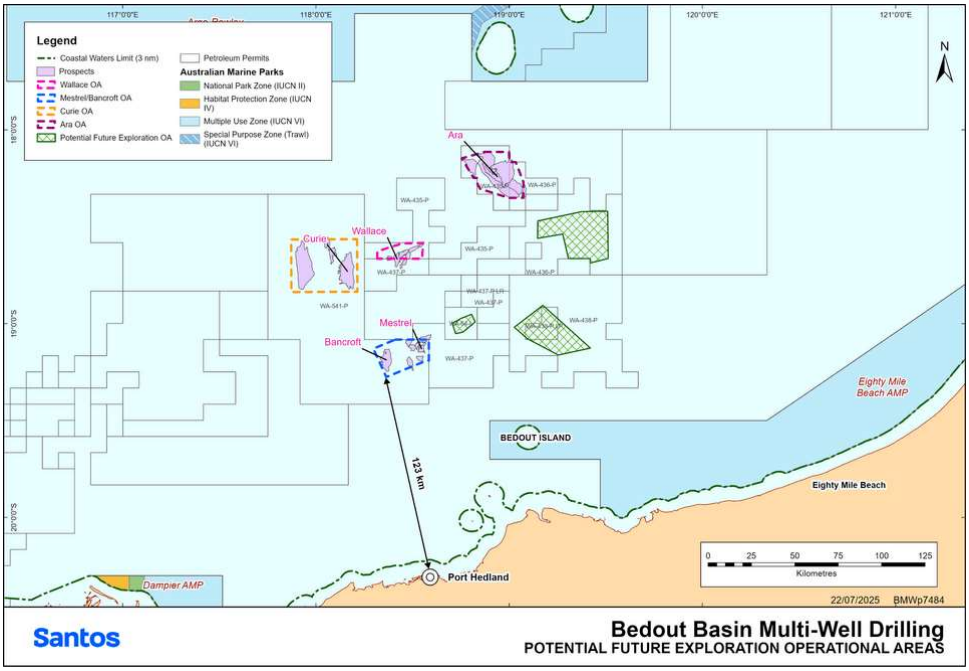
You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities, organisations or individuals who may have functions, interests or activities which may be affected by the proposed activities and should participate in the consultation process.

Please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.

Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

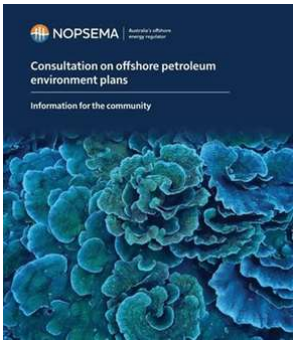
If you wish to discuss the consultation process or provide feedback for the EP, you can do so via return email or call us toll free on **1800 267 600**.

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OA's is welcome during this consultation; however, further details and information will be provided in due course.




## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

Santos

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

If you'd like to unsubscribe and stop receiving these emails click here.

**Email Type 2 where authorities, persons and organisations may be affected by risks from unplanned events only given their significant distance from proposed activities.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| 443 | 23/07/2025 | Sent | Campaign Email | General Factsheet; Fisher Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 2** CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |

CON-443 -Organisations

3D Energi; Ashburton Anglers; Australian Communications and Media Authority; Beagle No. 1; BP Developments Australia; Buurabalayji Thalanyji Aboriginal Corporation; Cape Conservation Group; Carnarvon Chamber of Commerce and Industry; Carnarvon Fishing Club; Chevron Australia; City of Karratha; Coral Bay Progress Association; DeepCstore; Department of Biodiversity, Conservation and Attractions; Department of Climate Change, Energy, the Environment and Water - Director of National Parks; Department of Defence; Department of Energy, Mines, Industry Regulation and Safety; Department of Foreign Affairs and Trade; Department of Jobs, Tourism, Science and Innovation; Department of Planning, Lands and Heritage; Department of Transport - Marine pollution; Department of Water and Environmental Regulation; Eighty Mile Beach Caravan Park WA; Dwayne Wescombe; Exmouth Game Fishing Club; Finder Energy; Gascoyne Development Commission; Gogolanygor Aboriginal Corporation; INPEX; International Fund for Animal Welfare; Jadestone Energy; Karajarri Traditional Lands Association; Karratha & Districts Chamber of Commerce and Industry; KATO Energy; King Bay Game Fishing Club; KUFPEC; Kunin Aboriginal Corporation; Malgana Aboriginal Corporation; Melbana Energy; Murujuga Aboriginal Corporation; Nganhurra Thanardi Garrbu Aboriginal Corporation; Ngarluma Aboriginal Corporation; Nickol Bay Sportfishing Club; Ningaloo Coast World Heritage Advisory Committee; Onslow Chamber of Commerce and Industry; Pathfinder Energy Pty Ltd; Pilbara Development Commission; Pilbara Ports Authority; Port Hedland Chamber of Commerce & Industry; Port Hedland Game Fishing Club; Port Hedland Industries Council; Protect Ningaloo; Recfishwest; Regional Development Australia - Mid West Gascoyne; Regional Development Australia – Pilbara; Shark Bay World Heritage Advisory Committee; Shire of Ashburton; Shire of Carnarvon; Shire of East Pilbara; Shire of Exmouth; Shire of Shark Bay; Telstra
Town of Port Hedland; Vermilion Oil & Gas; Vocus Group Ltd; WA Local Government Association; Western Australian Museum; Western Gas; Wirrawandi Aboriginal Corporation; Woodside Energy Group Ltd; Yawuru Native Title Holders Aboriginal Corporation; Yinggarda Aboriginal Corporation; InCapture P/L; Exmouth Community Liaison Group; Thalanyji Nhuwala People; Nhuwala Claim Group

Outlook

# ![EXT]: CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Wed 23/07/2025 12:04
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

We are contacting you because Santos considers that you may have functions, interests or activities which may be affected by the proposed activities, although we expect this would only be in the unlikely event of a worst-case hydrocarbon spill.

Information about planned activities, including a summary of Activity key impacts, risks and management measures is included in a Consultation Fact

Sheet that can be accessed via this link to our Consultation Hub web site.

Information and maps are also included showing how we use sophisticated computer-based modelling to present the areas that could be affected in the unlikely event of a spill, noting that not all areas within the modelled Environment that May Be Affected (EMBA) would be affected at the same time.


Santos

Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities on your functions, interests or activities.
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please let us know if you would like any information you provide to us not to be published. If requested, Santos will ensure your information is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities, organisations or individuals who may have functions, interests or activities

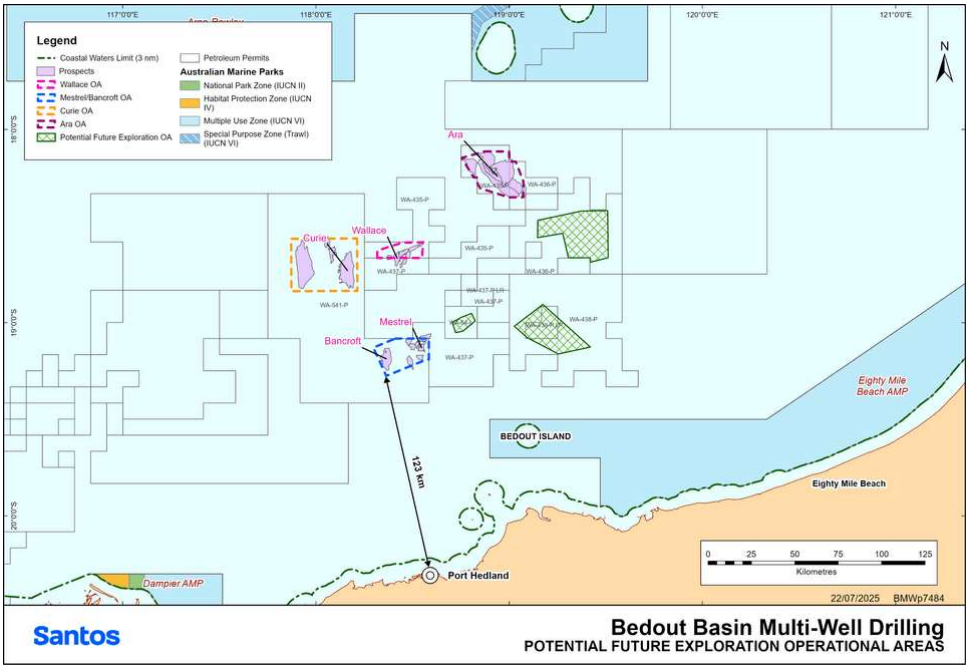
which may be affected by the proposed activities and should participate in the consultation process.

Please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.

Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

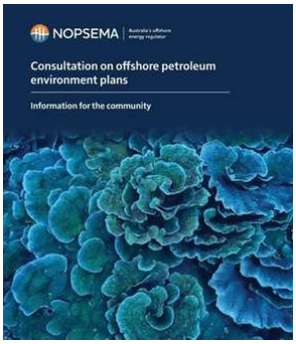
If you wish to discuss the consultation process or provide feedback for the EP, you can do so via return email or call us toll free on **1800 267 600**.

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OA's is welcome during this consultation; however, further details and information will be provided in due course.




## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

If you'd like to unsubscribe and stop receiving these emails click here.

**Email Type 3 where it is not clear from publicly available information where authorities, persons and organisations may be affected by impacts from planned activities and risks from unplanned events.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| 446 | 23/07/2025 | Sent | Campaign Email | General Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 3** CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |

CON-446 - Organisations

All the Gear No Idea Sportfishing; Apache Charters; Aqualand Charters; Archipelago Adventures; Australian Energy Producers; Australian Institute of Marine Science; Australian Tourism Industry Council; Baiyungu Dreaming; Blue Horizon Charters; Blue Juice Charters; Centre for Whale Research; Commonwealth Scientific and Industrial Research Organisation; Coral Bay Ecotours; Coral Coast Tours; Curtin University Centre for Marine Science and Technology; Dampier Archipelago and Murujuga Sea Kayak Expedition; Department of Industry, Science and Resources; Dive Ningaloo; Edith Cowan University; Evolution Fishing Charters Exmouth; Exmouth Adventure Co; Exmouth Dive & Whalesharks Ningaloo; Exmouth Fishing Adventures; Fisheries Research and Development Corporation; GT Diving; Indigenous Land and Sea Council; Innkeeper Sport Fishing; Karratha Adventure Sports; Kings Ningaloo Reef Tours; Lethal Adventures; Live Ningaloo; Maccy Dave's Kayak Fishing Adventures; Mackerel Islands Fishing Charters; Mahi Mahi Fishing Charters Marine Tourism Western Australia; Maritime Industry Australia Ltd; Minderoo Foundation Exmouth Research Lab; Montebello Island Safaris; Murdoch University; Murujuga Rock Art & Cultural Tours Pilbara WA; National Indigenous Australians Agency; Ngurrangga Tours; Ningaloo Car & Boat Hire; Ningaloo Coral Bay Boats; Ningaloo Marine Interactions; Ningaloo Reef Dive; Ningaloo Safari Tours; Ningaloo Sportfishing Charters; Ningaloo Whale Shark N Dive; Ningaloo Whale Sharks Exmouth; Oceanus Sport Fishing Charters; On Point Spearfishing; On Strike Charters; Onslow Beach Resort; Peak Sport Fishing Adventures; Pelican Charters; Pilbara Dive and Tours; Pilbara Tours; Reel Teaser Fishing Adventures; Sail Ningaloo; Sal Salis; Seaforce Fishing Charters; Seastar Boat Charters; Shark Bay Charters; Shark Bay Coastal Tours; Shark Bay Eco Tours; The Pew Charitable Trusts; The Shark Ark Project; Top Gun Charters; Tourism Council of Western Australia; University of Western Australia Oceans Institute; View Ningaloo; WA Fishing Charters; Western Australian Indigenous Tourism Operators Council; Western Australian Marine Science Institution; Reef Seeker Charters; Pardoo Tourist Park; Pardoo Station; James Cook University; Shark Bay Dolphin Project; Nhuwala Claim Group

Outlook

# ![EXT]: CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Wed 23/07/2025 12:29
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

We are contacting you because it is not clear to Santos, based on publicly available information, whether your functions, interests or activities may be affected by the proposed activities. Please consider the information we have provided with this email and let us know if you would like to be consulted for these proposed activities.

Information about planned activities, including a summary of Activity key impacts, risks and management measures is included in a Consultation Fact Sheet that can be accessed via this link to our Consultation Hub web site.

Information and maps are also included showing how we use sophisticated computer-based modelling to present the areas that could be affected in the unlikely event of a spill, noting that not all areas within the modelled Environment that May Be Affected (EMBA) would be affected at the same time.


Santos

Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities on your functions, interests or activities
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please let us know if you would like any information you provide to us not to be published. If requested, Santos will ensure your information is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

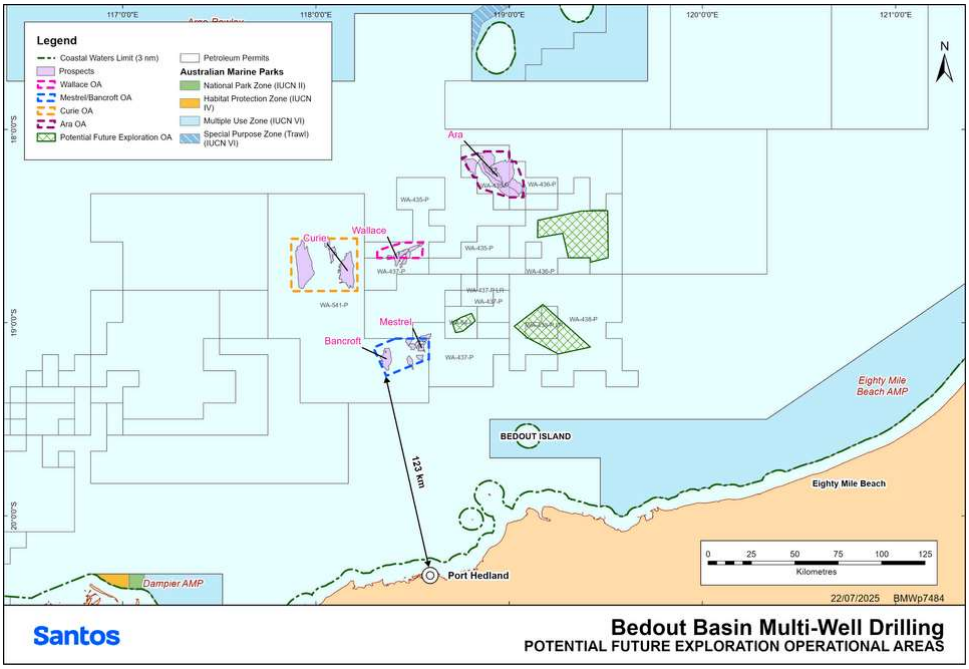
You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities,

organisations or individuals who may have functions, interests or activities which may be affected by the proposed activities and should participate in the consultation process.

Additionally, please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.
Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

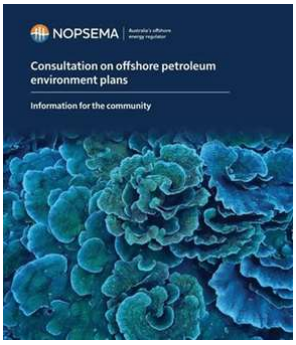
If you wish to discuss the consultation process or provide feedback for the EP, you can do so via return email or call us toll free on **1800 267 600**.

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OA's is welcome during this consultation; however, further details and information will be provided in due course.




## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

If you'd like to unsubscribe and stop receiving these emails click here.

**Email Type 1a where authorities, persons and organisations with commercial fishing interests may be affected by impacts from planned activities and risks from unplanned events given their proximity to proposed activities.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| 441 | 23/07/2025 | Sent | Campaign Email | General Factsheet; Fisher Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 1a** CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |
| Con-441 - Organisations<br>Aquaculture Council of Western Australia; Department of Primary Industries and Regional Development; Pearl Producers Association; Western Australian Fishing Industry Council; Western Rock Lobster Council | | | | | |

Outlook

# ![EXT]: CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Wed 23/07/2025 11:56
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

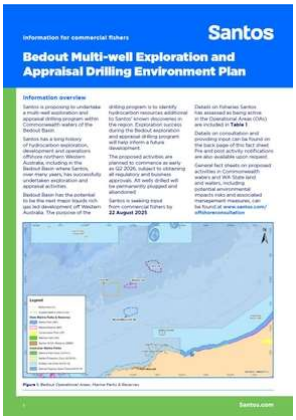
Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

For activities proposed to be managed under this EP, Santos has assessed that State fisheries may be active in the Operational Areas for proposed activities. These fisheries, as well other fisheries that have a spatial overlap with the environment that may be affected, are identified in a commercial fishery fact sheet.

The commercial fishery fact sheet is provided supplemental to a General Fact Sheet that provides more detail about proposed activities, including a summary of Activity key impacts, risks and management measures.

Both fact sheets can be accessed vis this link to our Consultation Hub web site or via hyperlinks in the images below.




## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities.
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please also let us know if you

would like any sensitive information you provide during consultation not to be published to remain private. If requested, Santos will ensure your information remains confidential between us and NOPSEMA and will not be published or otherwise made publicly available. This is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

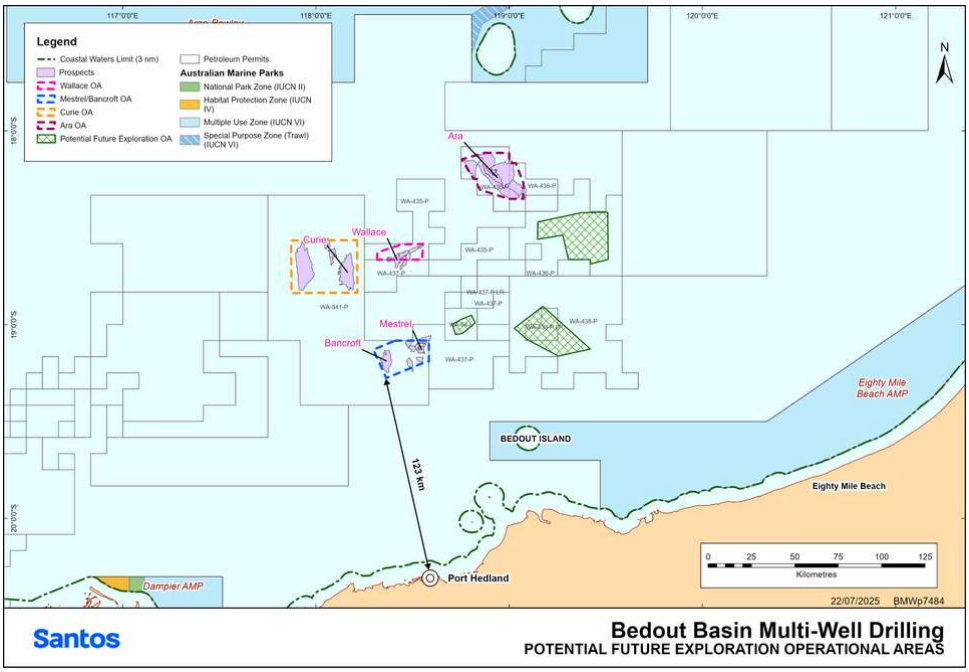
You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities, organisations or individuals who may have functions, interests or activities which may be affected by the proposed activities and should participate in the consultation process.

Please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.

Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

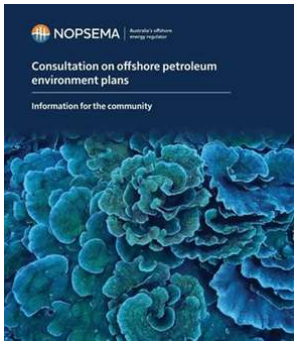
You can provide feedback via return email or call us toll free on **1800 267 600.**

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OA's is welcome during this consultation, however, further details and information will be provided in due course.




## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

Santos

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

If you'd like to unsubscribe and stop receiving these emails click here.

**Email Type 2a where authorities, persons and organisations with commercial fishing interests may be affected by risks from unplanned events only given their significant distance from proposed activities.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| 444 | 23/07/2025 | Sent | Campaign Email | General Factsheet; Fisher Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 2a** CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |
| Con-444 - Organisations<br>Australian Fisheries Management Authority; Australian Southern Bluefin Tuna Industry Association; Commonwealth Fisheries Association; Department of Agriculture, Fisheries and Forestry - Biosecurity marine pests; Department of Agriculture, Fisheries and Forestry - Fisheries Division; Tuna Australia | | | | | |

Outlook

# ![EXT]: CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Wed 23/07/2025 12:19
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

For activities proposed to be managed under this EP, Santos has assessed that Commonwealth fisheries are unlikely to be active in the Operational Areas for proposed activities. All Commonwealth fisheries, including those fisheries that have a spatial overlap with the environment that may be affected, are identified in a commercial fishery fact sheet.

The commercial fishery fact sheet is provided supplemental to a General Fact Sheet that provides more detail about proposed activities, including a summary of Activity key impacts, risks and management measures.

Both fact sheets can be accessed vis this link to our Consultation Hub web site or via hyperlinks in the images below.







## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities.
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please also let us know if you

would like any sensitive information you provide during consultation not to be published to remain private. If requested, Santos will ensure your information remains confidential between us and NOPSEMA and will not be published or otherwise made publicly available. This is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

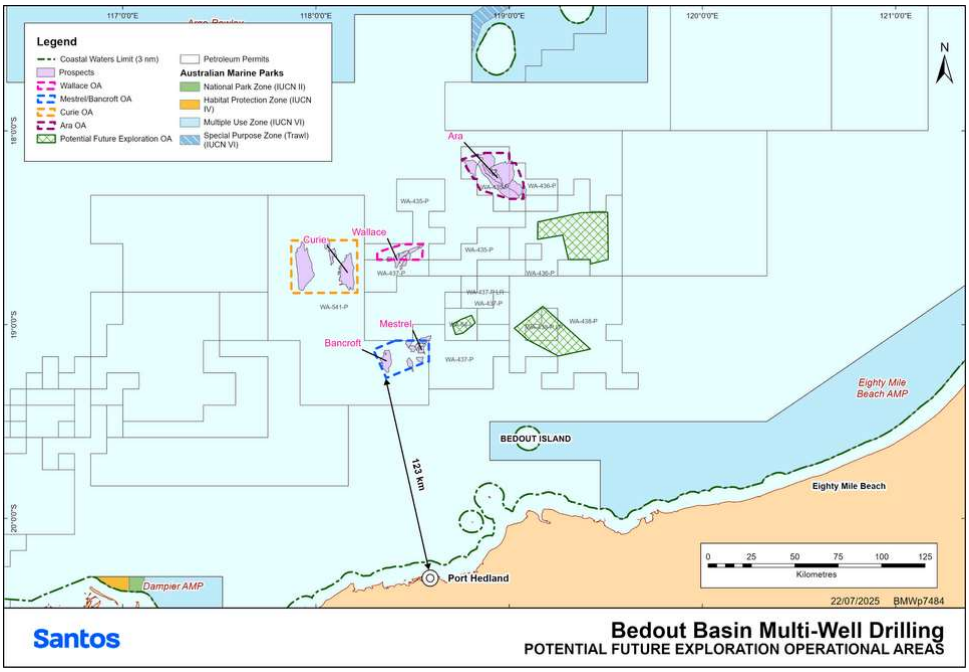
You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities, organisations or individuals who may have functions, interests or activities which may be affected by the proposed activities and should participate in the consultation process.

Please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.

Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

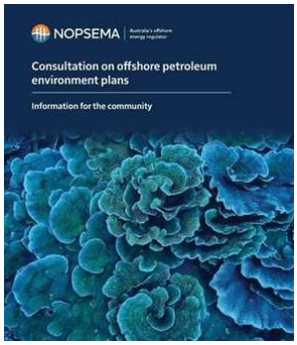
You can provide feedback via return email or call us toll free on **1800 267 600**.

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OAs is welcome during this consultation, however, further details and information will be provided in due course.




## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

Santos

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

If you'd like to unsubscribe and stop receiving these emails click here.

# Reminder email consultations

**Email Type 1 where authorities, persons and organisations may be affected by impacts from planned activities and risks from unplanned events given their proximity to proposed activities.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| **558** | 14/08/2025 | Sent | Reminder Email | General Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 1** Reminder - CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |
| CON-558 - Organisations<br>Australian Border Force; Australian Conservation Foundation; Australian Hydrographic Office; Australian Marine Conservation Society; Australian Maritime Safety Authority - marine pollution; Care for Hedland Environmental Association; Conservation Council of WA; Department of Climate Change, Energy, the Environment and Water - Underwater cultural heritage; Greenpeace Australia Pacific; Kariyarra Aboriginal Corporation; Kimberley Land Council; Nyangumarta Karajarri Aboriginal Corporation; Nyaparu; Sea Shepherd Australia; Wanparta Aboriginal Corporation; Whale and Dolphin Conservation; Wilderness Society; World Wide Fund for Nature; Yamatji Marlpa Aboriginal Corporation | | | | | |

Outlook

# ![EXT]: Reminder - CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Thu 14/08/2025 11:31
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you by way of reminder to provide any input to the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan (EP).

Thank you if you have already provided your feedback, however, if you still wish to do so please kindly provide by **22 August 2025.**

More information on the proposed activity can be found below in this email. You can provide input via return email or call us toll free on **1800 267 600**.

We look forward to hearing from you soon.

Regards
Santos Consultation Team

---

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of

preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

We are contacting you because Santos considers that you may have functions, interests or activities which may be affected by impacts from planned activities.

Information about planned activities, including a summary of Activity key impacts, risks and management measures is included in a Consultation Fact Sheet that can be accessed via this link to our Consultation Hub web site.

Information and maps are also included showing how we use sophisticated computer-based modelling to present the areas that could be affected in the unlikely event of a spill, noting that not all areas within the modelled Environment that May Be Affected (EMBA) would be affected at the same time.




## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities on your functions, interests or activities.
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please let us know if you would like any information you provide to us not to be published. If requested, Santos will ensure your information is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

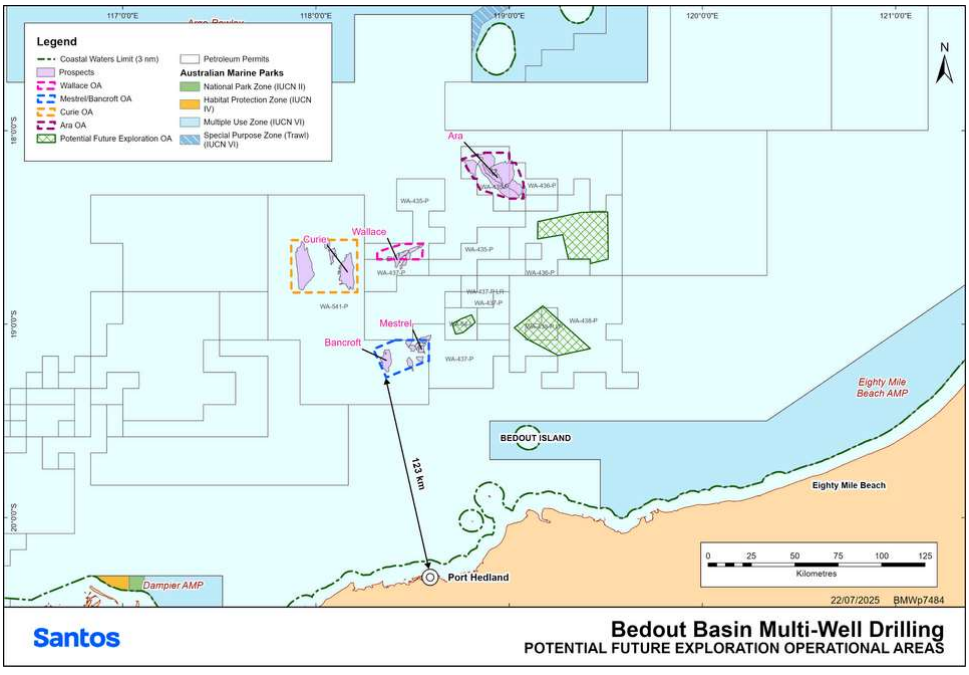
You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities, organisations or individuals who may have functions, interests or activities which may be affected by the proposed activities and should participate in the consultation process.

Please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.

Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

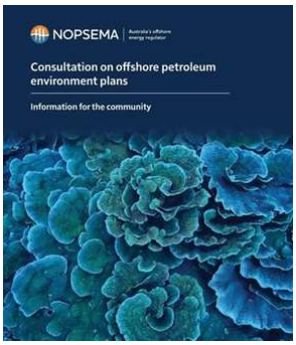
If you wish to discuss the consultation process or provide feedback for the EP, you can do so via return email or call us toll free on **1800 267 600**.

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OA's is welcome during this consultation; however, further details and information will be provided in due course.




## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

Santos

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

If you'd like to unsubscribe and stop receiving these emails click here.

**Email Type 2 where authorities, persons and organisations may be affected by risks from unplanned events only given their significant distance from proposed activities.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| **560** | 14/08/2025 | Sent | Reminder Email | General Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 2** Reminder - CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |

CON-560 -Organisations

3D Energi; Ashburton Anglers; Australian Communications and Media Authority; Beagle No. 1; BP Developments Australia; Buurabalayji Thalanyji Aboriginal Corporation; Cape Conservation Group; Carnarvon Chamber of Commerce and Industry; Carnarvon Fishing Club; Chevron Australia; City of Karratha; Coral Bay Progress Association; DeepCstore; Department of Biodiversity, Conservation and Attractions; Department of Climate Change, Energy, the Environment and Water - Director of National Parks; Department of Defence; Department of Energy, Mines, Industry Regulation and Safety; Department of Foreign Affairs and Trade; Department of Jobs, Tourism, Science and Innovation; Department of Planning, Lands and Heritage; Department of Transport - Marine pollution; Department of Water and Environmental Regulation; Eighty Mile Beach Caravan Park WA; Dwayne Wescombe; Exmouth Game Fishing Club; Finder Energy; Gascoyne Development Commission; Gogolanygor Aboriginal Corporation; INPEX; International Fund for Animal Welfare; Jadestone Energy; Karajarri Traditional Lands Association; Karratha & Districts Chamber of Commerce and Industry; KATO Energy; King Bay Game Fishing Club; KUFPEC; Kunin Aboriginal Corporation; Malgana Aboriginal Corporation; Melbana Energy; Murujuga Aboriginal Corporation; Nganhurra Thanardi Garrbu Aboriginal Corporation; Ngarluma Aboriginal Corporation; Nickol Bay Sportfishing Club; Ningaloo Coast World Heritage Advisory Committee; Onslow Chamber of Commerce and Industry; Pathfinder Energy Pty Ltd; Pilbara Development Commission; Pilbara Ports Authority; Port Hedland Chamber of Commerce & Industry; Port Hedland Game Fishing Club; Port Hedland Industries Council; Protect Ningaloo; Recfishwest; Regional Development Australia - Mid West Gascoyne; Regional Development Australia – Pilbara; Shark Bay World Heritage Advisory Committee; Shire of Ashburton; Shire of Carnarvon; Shire of East Pilbara; Shire of Exmouth; Shire of Shark Bay; Telstra; Town of Port Hedland; Vermilion Oil & Gas; Vocus Group Ltd; WA Local Government Association; Western Australian Museum; Western Gas; Wirrawandi Aboriginal Corporation; Woodside Energy Group Ltd; Yawuru Native Title Holders Aboriginal Corporation; Yinggarda Aboriginal Corporation; InCapture P/L; Exmouth Community Liaison Group; Thalanyji Nhuwala People; Nhuwala Claim Group

Outlook

# ![EXT]: Reminder - CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Thu 14/08/2025 11:39
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you by way of reminder to provide any input to the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan (EP).

Thank you if you have already provided your feedback, however, if you still wish to do so please kindly provide by **22 August 2025.**

More information on the proposed activity can be found below in this email. You can provide input via return email or call us toll free on **1800 267 600**.

We look forward to hearing from you soon.

Regards
Santos Consultation Team

---

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of

preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

We are contacting you because Santos considers that you may have functions, interests or activities which may be affected by the proposed activities, although we expect this would only be in the unlikely event of a worst-case hydrocarbon spill.

Information about planned activities, including a summary of Activity key impacts, risks and management measures is included in a Consultation Fact Sheet that can be accessed via this link to our Consultation Hub web site.

Information and maps are also included showing how we use sophisticated computer-based modelling to present the areas that could be affected in the unlikely event of a spill, noting that not all areas within the modelled Environment that May Be Affected (EMBA) would be affected at the same time.


Santos

Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities on your functions, interests or activities.
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please let us know if you would like any information you provide to us not to be published. If requested, Santos will ensure your information is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

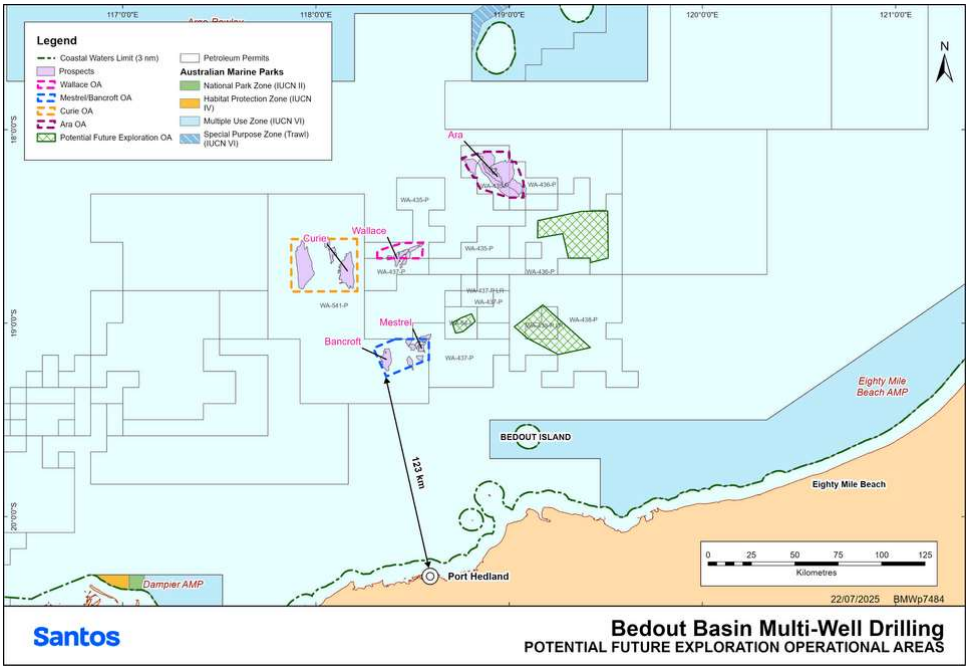
You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities, organisations or individuals who may have functions, interests or activities which may be affected by the proposed activities and should participate in the consultation process.

Please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.

Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

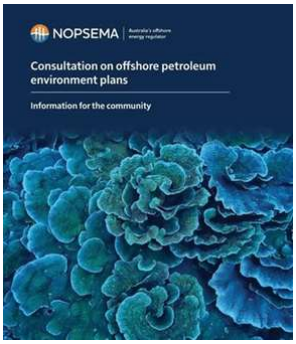
If you wish to discuss the consultation process or provide feedback for the EP, you can do so via return email or call us toll free on **1800 267 600**.

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OA's is welcome during this consultation; however, further details and information will be provided in due course.




## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

Santos

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

If you'd like to unsubscribe and stop receiving these emails click here.

**Email Type 3 where it is not clear from publicly available information where authorities, persons and organisations may be affected by impacts from planned activities and risks from unplanned events.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| 562 | 14/08/2025 | Sent | Reminder Email | General Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 3** Reminder - CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |

CON-562 - Organisations

All the Gear No Idea Sportfishing; Apache Charters; Aqualand Charters; Archipelago Adventures; Australian Energy Producers; Australian Institute of Marine Science; Australian Tourism Industry Council; Baiyungu Dreaming; Blue Horizon Charters; Blue Juice Charters; Centre for Whale Research; Commonwealth Scientific and Industrial Research Organisation; Coral Bay Ecotours; Coral Coast Tours; Curtin University Centre for Marine Science and Technology; Dampier Archipelago and Murujuga Sea Kayak Expedition; Department of Industry, Science and Resources; Dive Ningaloo; Edith Cowan University; Evolution Fishing Charters Exmouth; Exmouth Adventure Co; Exmouth Dive & Whalesharks Ningaloo; Exmouth Fishing Adventures; Fisheries Research and Development Corporation; GT Diving; Indigenous Land and Sea Council; Innkeeper Sport Fishing; Karratha Adventure Sports; Kings Ningaloo Reef Tours; Lethal Adventures; Live Ningaloo; Maccy Dave's Kayak Fishing Adventures; Mackerel Islands Fishing Charters; Mahi Mahi Fishing Charters Marine Tourism Western Australia; Maritime Industry Australia Ltd; Minderoo Foundation Exmouth Research Lab; Montebello Island Safaris; Murdoch University; Murujuga Rock Art & Cultural Tours Pilbara WA; National Indigenous Australians Agency; Ngurrangga Tours; Ningaloo Car & Boat Hire; Ningaloo Coral Bay Boats; Ningaloo Marine Interactions; Ningaloo Reef Dive; Ningaloo Safari Tours; Ningaloo Sportfishing Charters; Ningaloo Whale Shark N Dive; Ningaloo Whale Sharks Exmouth; Oceanus Sport Fishing Charters; On Point Spearfishing; On Strike Charters; Onslow Beach Resort; Peak Sport Fishing Adventures; Pelican Charters; Pilbara Dive and Tours; Pilbara Tours; Reel Teaser Fishing Adventures; Sail Ningaloo; Sal Salis; Seaforce Fishing Charters; Seastar Boat Charters; Shark Bay Charters; Shark Bay Coastal Tours; Shark Bay Eco Tours; The Pew Charitable Trusts; The Shark Ark Project; Top Gun Charters; Tourism Council of Western Australia; University of Western Australia Oceans Institute; View Ningaloo; WA Fishing Charters; Western Australian Indigenous Tourism Operators Council; Western Australian Marine Science Institution; Reef Seeker Charters; Pardoo Tourist Park Pardoo Station; James Cook University; Shark Bay Dolphin Project; Nhuwala Claim Group

Outlook

# ![EXT]: Reminder - CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Thu 14/08/2025 11:50
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you by way of reminder to provide input to the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan (EP).

Thank you if you have already provided your feedback, however, if you still wish to do so please kindly provide by **22 August 2025.**

More information on the proposed activity can be found below in this email. You can provide input via return email or call us toll free on **1800 267 600**.

We look forward to hearing from you soon.

Regards
Santos Consultation Team

---

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of

preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

We are contacting you because it is not clear to Santos, based on publicly available information, whether your functions, interests or activities may be affected by the proposed activities. Please consider the information we have provided with this email and let us know if you would like to be consulted for these proposed activities.

Information about planned activities, including a summary of Activity key impacts, risks and management measures is included in a Consultation Fact Sheet that can be accessed via this link to our Consultation Hub web site.

Information and maps are also included showing how we use sophisticated computer-based modelling to present the areas that could be affected in the unlikely event of a spill, noting that not all areas within the modelled Environment that May Be Affected (EMBA) would be affected at the same time.


Santos

Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities on your functions, interests or activities
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined

in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

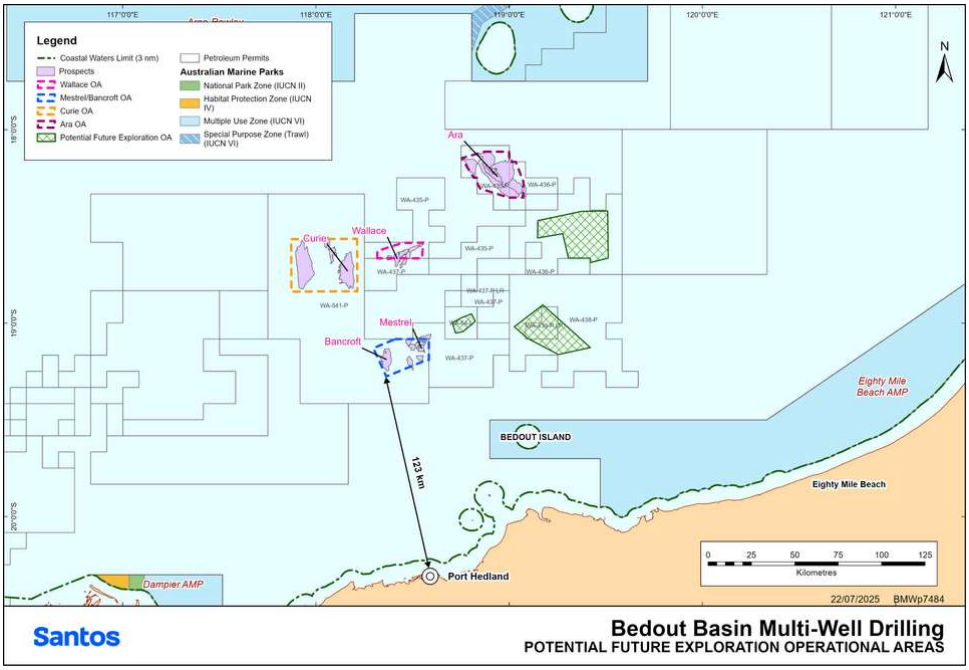
Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please let us know if you would like any information you provide to us not to be published. If requested, Santos will ensure your information is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities, organisations or individuals who may have functions, interests or activities which may be affected by the proposed activities and should participate in the consultation process.

Additionally, please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.
Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

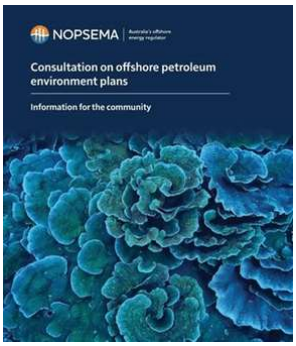
If you wish to discuss the consultation process or provide feedback for the EP, you can do so via return email or call us toll free on **1800 267 600**.

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OA's is welcome during this consultation; however, further details and information will be provided in due course.



## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

Santos

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

If you'd like to unsubscribe and stop receiving these emails click here.

**Email Type 1a where authorities, persons and organisations with commercial fishing interests may be affected by impacts from planned activities and risks from unplanned events given their proximity to proposed activities.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| 559 | 14/08/2025 | Sent | Reminder Email | General Factsheet; Fisher Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 1a** Reminder - CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |
| Con-559 - Organisations<br>Aquaculture Council of Western Australia; Department of Primary Industries and Regional Development; Pearl Producers Association; Western Australian Fishing Industry Council; Western Rock Lobster Council | | | | | |

Outlook

**![EXT]: Reminder - CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP**

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Thu 14/08/2025 11:35
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you by way of reminder to provide any input to the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan (EP).

Thank you if you have already provided your feedback, however, if you still wish to do so please kindly provide by **22 August 2025.**

More information on the proposed activity can be found below in this email. You can provide input via return email or call us toll free on **1800 267 600**.

We look forward to hearing from you soon.

Regards
Santos Consultation Team

---

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of

preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

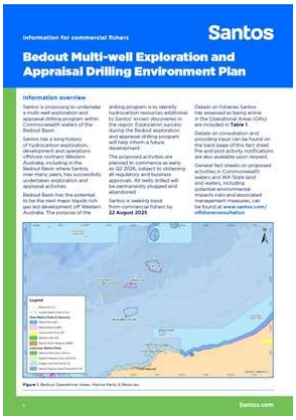
Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

For activities proposed to be managed under this EP, Santos has assessed that State fisheries may be active in the Operational Areas for proposed activities. These fisheries, as well other fisheries that have a spatial overlap with the environment that may be affected, are identified in a commercial fishery fact sheet.

The commercial fishery fact sheet is provided supplemental to a General Fact Sheet that provides more detail about proposed activities, including a summary of Activity key impacts, risks and management measures.

Both fact sheets can be accessed vis this link to our Consultation Hub web site or via hyperlinks in the images below.




## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities.
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please also let us know if you would like any sensitive information you provide during consultation not to be published to remain private. If requested, Santos will ensure your information remains confidential between us and NOPSEMA and will not be published or otherwise made publicly available. This is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

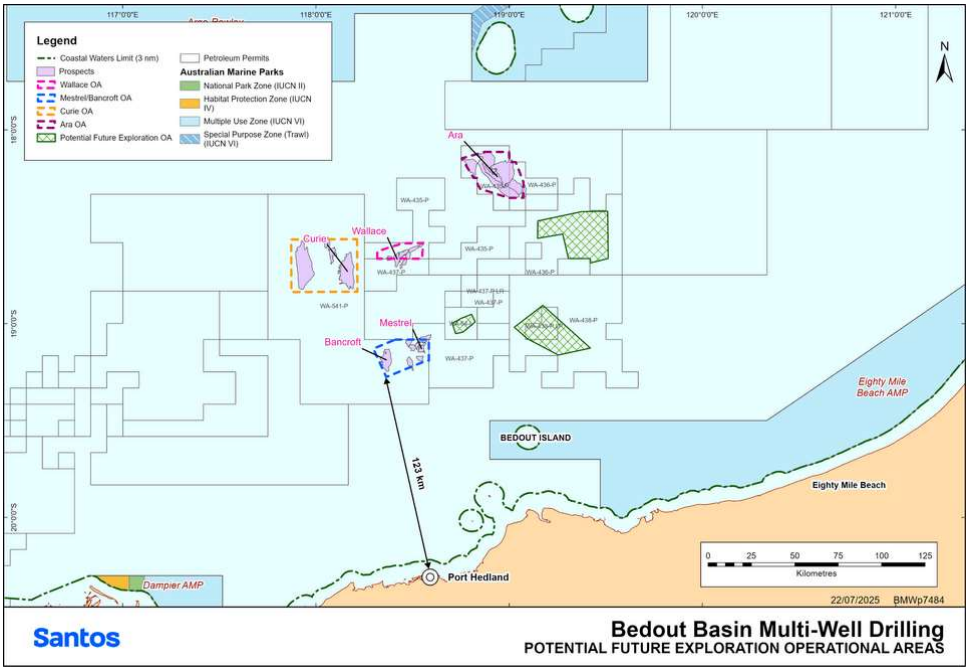
You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities, organisations or individuals who may have functions, interests or activities which may be affected by the proposed activities and should participate in the consultation process.

Please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.

Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

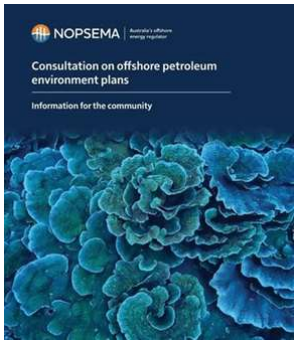
You can provide feedback via return email or call us toll free on **1800 267 600.**

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OA's is welcome during this consultation, however, further details and information will be provided in due course.




## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

If you'd like to unsubscribe and stop receiving these emails click here.

Santos

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

**Email Type 2a where authorities, persons and organisations with commercial fishing interests may be affected by risks from unplanned events only given their significant distance from proposed activities.**

| CON No. | Date | Sent/ Received | Record Type | Consultation Materials | Email Subject |
|---|---|---|---|---|---|
| **561** | 14/08/2025 | Sent | Reminder Email | General Factsheet; Map | Multi-well Exploration and Appraisal Drilling EP - **Email 2a** Reminder - CONSULTATION \| Bedout Basin \| Bedout Multi-well Exploration and Appraisal Drilling EP |
| Con-444 - Organisations<br>Australian Southern Bluefin Tuna Industry Association; Commonwealth Fisheries Association; Department of Agriculture, Fisheries and Forestry - Biosecurity marine pests; Department of Agriculture, Fisheries and Forestry - Fisheries Division; Tuna Australia | | | | | |

Outlook

# ![EXT]: Reminder - CONSULTATION | Bedout Basin | Bedout Multi-well Exploration and Appraisal Drilling EP

**From** Santos Consultation Team <offshore.consultation@santos.com>
**Date** Thu 14/08/2025 11:43
**To** Consultation, Santos <Offshore.consultation@santos.com>

Dear Offshore Consultation,

Santos is contacting you by way of reminder to provide any input to the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan (EP).

Thank you if you have already provided your feedback, however, if you still wish to do so please kindly provide by **22 August 2025.**

More information on the proposed activity can be found below in this email. You can provide input via return email or call us toll free on **1800 267 600**.

We look forward to hearing from you soon.

Regards
Santos Consultation Team

---

Dear Offshore Consultation,

Santos is contacting you as we are proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

An Environment Plan (EP) is being prepared for the proposed activities and will have validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas. The closest Operational Area to the Western Australian mainland is Mestrel/Bancroft and is approximately 123 km north of Port Hedland.

## Why are we contacting you?

Under Commonwealth Government Regulations, Santos is required to consult with relevant persons about proposed activities in the course of

preparing an EP.

A relevant person includes government agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Information provided by relevant persons in consultation helps us to better understand the values and sensitivities of the environment and inform the evaluation of the potential impacts and risks associated with the activity and how to manage them appropriately.

For activities proposed to be managed under this EP, Santos has assessed that Commonwealth fisheries are unlikely to be active in the Operational Areas for proposed activities. All Commonwealth fisheries, including those fisheries that have a spatial overlap with the environment that may be affected, are identified in a commercial fishery fact sheet.

The commercial fishery fact sheet is provided supplemental to a General Fact Sheet that provides more detail about proposed activities, including a summary of Activity key impacts, risks and management measures.

Both fact sheets can be accessed vis this link to our Consultation Hub web site or via hyperlinks in the images below.







## Providing feedback

As part of the consultation for proposed activities we are seeking any input you may have about:

- Features of the environment that may be affected by proposed activities, including social, economic and cultural values and sensitivities.
- Potential environmental impacts and risks of proposed activities, including the potential consequences of the activities.
- What, if any, measures could reduce environmental impacts or risks, considering those measures already proposed by Santos and outlined in the Consultation Fact Sheet.

Feedback received during consultation will be considered in the development of the EP, which will be submitted to the Commonwealth Regulator, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), for assessment.

Please note that the information provided during consultation will be included in documentation submitted to NOPSEMA. Please also let us know if you would like any sensitive information you provide during consultation not to be published to remain private. If requested, Santos will ensure your information remains confidential between us and NOPSEMA and will not be published or otherwise made publicly available. This is included in a separate report which is not published on NOPSEMA's website. Santos will handle your information in accordance with our Offshore Western Australia and Northern Territory Consultation Privacy Policy.

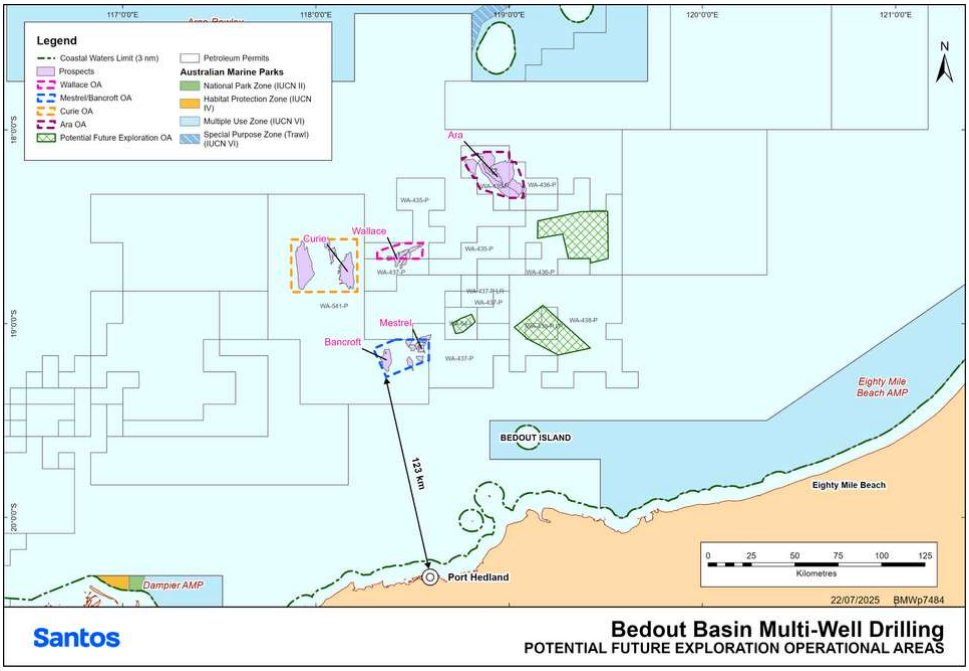
You are also invited to pass on consultation information to any persons you consider appropriate and let us know if you know of any other authorities, organisations or individuals who may have functions, interests or activities which may be affected by the proposed activities and should participate in the consultation process.

Please let us know if you would like to receive an activity notification in advance and upon completion of planned activities.

Santos welcomes your feedback specific to the proposed activities described under the proposed EP by the close of business on **22 August 2025**.

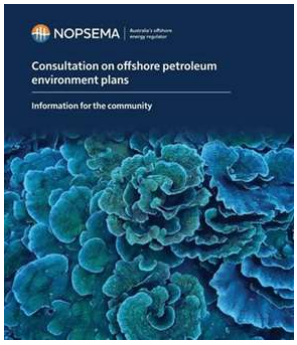
You can provide feedback via return email or call us toll free on **1800 267 600**.

Additionally, Santos will be working on a second EP with additional OAs in the Bedout Basin in the near future (please refer to attached map below). Any initial feedback on these additional OAs is welcome during this consultation, however, further details and information will be provided in due course.




## Where can you get more information?

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at NOPSEMA.gov.au.
**Click the image to read in full.**




We look forward to hearing from you soon.

Regards,

Santos Consultation Team

If you'd like to unsubscribe and stop receiving these emails click here.

Santos

t: +61 1800 267 600 | e: offshore.consulation@santos.com

Santos.com

Santos acknowledges the Traditional Owners and Custodians of the lands on which we operate. We pay our respects to their Elders past, present and emerging.

# Fact sheets

Information for relevant persons

Santos

# Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

## Activity Overview

Santos is proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

Santos has a long history of hydrocarbon exploration, development and operations offshore northern Western Australia, including in the Bedout Basin where Santos, over many years, has successfully undertaken exploration and appraisal activities. Bedout Basin has the potential to be the next major liquids rich gas development off Western Australia.

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

The Environment Plan (EP) being prepared for proposed activities will have a validity of five years, once accepted, to allow for the drilling of up to seven exploration and/or appraisal wells across four Operational Areas (OAs). The closest OA to the Western Australia mainland – Mestrel/Bancroft – and is approximately 123 km north of Port Hedland, WA.

## Consultation and Feedback

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

Under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023* (Cth) (OPGGS Environment Regulations), Santos is required to consult with relevant persons about proposed activities in the course of preparing an EP. A relevant person includes Commonwealth and State agencies and authorities to which the proposed activity may be relevant, and persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Santos meets this requirement by undertaking consultation. More details on consultation and providing feedback can be found on the back page of this factsheet.

If you consider you may be a relevant person, please contact us as soon as possible to initiate consultation with you and so you can tell us how you would like to be consulted throughout the consultation process or if you need additional information. The consultation period for this EP closes **22 August 2025**.

More details about the Commonwealth Government environmental approval process can be found on the NOPSEMA website at **NOPSEMA.gov.au**.

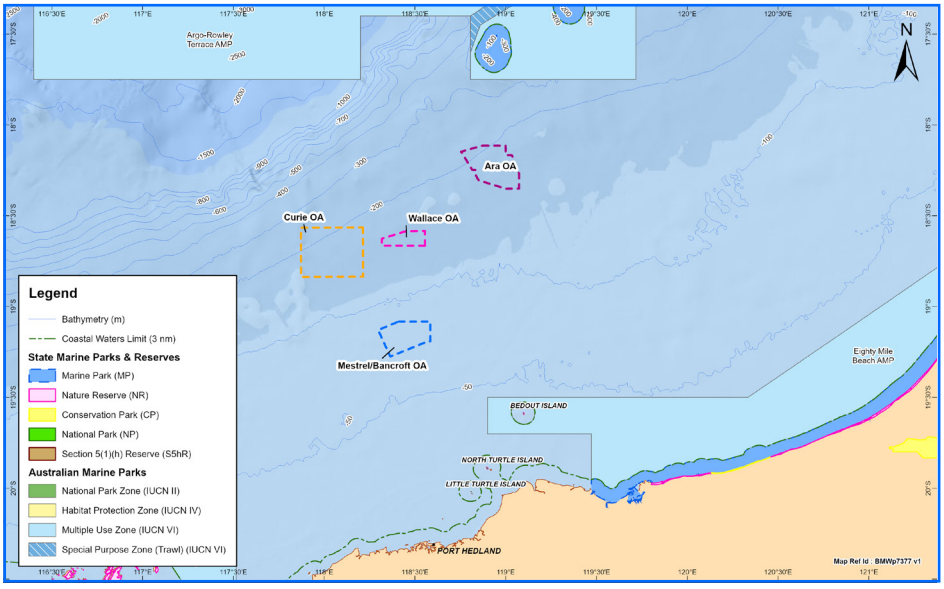



***Figure 1.*** *Bedout Operational Areas, Marine Parks & Reserves.*

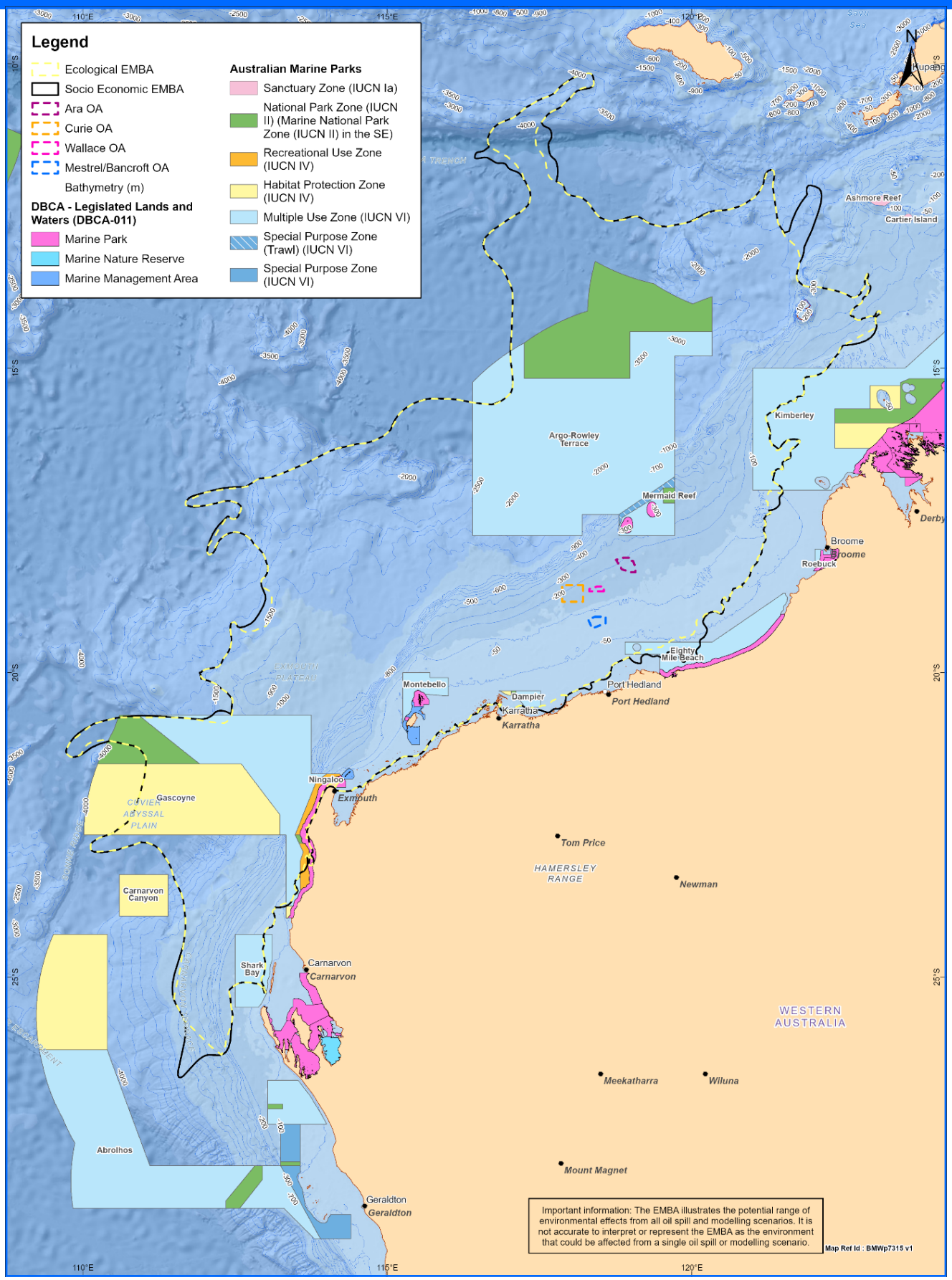



***Figure 2.*** *Bedout Multi-well Exploration and Appraisal Drilling Activity EMBA.*

## Activity Description

An overview of proposed activities is outlined in **Table 1**.
Activities are proposed in four OAs, details of which are outlined in **Table 2**.

**Table 1. Planned Activities**

| Planned Activities | |
|---|---|
| **Indicative timing** | Drilling and appraisal activities may occur any time between Q2 2026 and Q2 2031, subject to obtaining all regulatory and business approvals |
| **Duration** | Expected duration to drill each well between 40 to 110 days, with drilling duration subject to change based on geological conditions and potential for operational challenges.<br>The commencement and completion of individual drilling activities across the five-year period will vary, subject to vessel availability, weather conditions, and technical/equipment requirements, amongst others. |
| **Planned activities** | **Drilling activities**<br>• Pre-mobilisation surveys<br>• Drill up to 7 (exploration and/or appraisal) wells using a mobile offshore drilling unit (MODU) (either semi-submersible or jack-up depending on water depth)<br>• Pre-lay moorings for the semi-submersible MODU<br>• Pre-load and jack-up to operational elevation (if jack-up is used).<br>• MODU and vessel mobilisation and demobilisation activities<br>• Deploy, operate and remove temporary acoustic survey positioning system.<br>• Install risers, wellhead and blow-out preventer (BOP)<br>• Pressure test BOP<br>• Prepare and drill the well<br>• Run well evaluation program and collect downhole data to assess the well and surrounding formation (vertical seismic profile, core, wireline)<br>• Install a permanent barrier (cement plug) to permanently abandon well<br>• Remove well casings and wellhead (below or at the seabed)<br>• Demobilise the MODU or move MODU to commence drilling of another well in another OA<br>**Vessel-based surveys**<br>• Geophysical and geotechnical surveys to determine suitable MODU installation and operation locations<br>• Duration of one to two weeks at each well and within an area of approximately 5 km by 5 km<br>• Other geotechnical surveys, such as seabed sampling, core and grab, to establish a detailed evaluation of the foundation soils<br>• Hydrographic surveys to measure the physical features underwater<br>• Metrology surveys to provide subsea (infrastructure) measurements as part of installation |

| | |
|---|---|
| **Vessels / aircraft and other equipment** | • MODU (either semi-submersible or jack-up) depending on water depth<br>• Up to four support vessels are required to assist with anchor handling, MODU towing, transportation of equipment and consumables, and bunkering (refuelling)<br>• Helicopters will be used for crew changes; critical equipment supply and emergency response. Helicopter flights are planned as required as per drilling campaign<br>• Remote operating vehicle (ROV) will be used to monitor drilling operations, conduct periodic visual surveys and any required manipulation of subsea equipment<br>• Autonomous underwater vehicle (AUV) will be used to conduct several geophysical and inspection payloads, such as sub-bottom profilers, multibeam echosounders, cameras, side scan sonars and conductivity, temperature and depth instruments |
| **Description of the natural environment in the OAs** | The seabed within the OAs are generally flat and featureless, predominantly sand, with a proportion of silt and clay, which is consistent with much of the mid-continental shelf in the Northwest Shelf (NWS) region. |
| **Description of the environment that may be affected (EMBA)?** | Santos has undertaken an assessment to define environmental and socio-economic values, and sensitivities that may be affected by proposed activities. To do this, Santos has considered the areas where activity impacts and risks may occur.<br>Activity impacts typically may occur within Operational Areas, the locations of which is provided in **Figure 1**.<br>The widest geographic extent of activity risk is defined by potential ecological and socio-economic impacts resulting from a credible worst-case spill event.<br>For this EP, we have considered a loss of well control during drilling as being the most credible spill event.<br>As part of spill response planning, Santos considered exposure values for the four oil phases of a spill, these being shoreline accumulation, floating oil, and dissolved and entrained oil in the water column.<br>These thresholds, combined with advanced and sophisticated computer modelling, enable Santos to present the areas that could be affected in the unlikely event of a spill.<br>The computer modelling overlays a great number (hundreds) of individual computer simulations, accounting for the range of metocean conditions experienced for the modelled events at their locations, to combine all these hypothetical oil spill events into a single map.<br>Each simulation run starts from the same location for each scenario with each run subject to a different set of wind, weather and ocean current conditions derived from historical data.<br>This modelling helps Santos to develop specific response strategies considering a range of spill scenarios. These strategies are described in the Oil Pollution Emergency Plan for this EP, (7720-650-EMP-0006) which will be reviewed and assessed by the Regulator as part of the environmental approval process. |

| | |
|---|---|
| **Exclusion zones** | A 500 m radius Petroleum Safety Zone (PSZ) exclusion zone will be in place around the MODU for the duration of the activity as a safety requirement to protect other marine users who might be in the area.<br>A 2,000 m cautionary zone will be established during anchor handling operations (for 2-3 days either side of rig arrival and departure). |
| **Petroleum permits and licences** | Exploration permits WA-435-P, WA-436-P, and WA-541-P. |

**Table 2. Operational Area locations and water depths**

| OA | Permits | Latitude | Longitude | Water Depth |
|---|---|---|---|---|
| **Ara** | WA-435-P<br>WA-436-P | 18° 06' 48.37" S<br>18° 06' 50.13" S<br>18° 09' 57.85" S<br>18° 09' 59.04" S<br>18° 16' 9.73" S<br>18° 21' 1.9" S<br>18° 21' 4.72" S<br>18° 18' 17.64" S<br>18° 16' 48.18" S<br>18° 14' 53.53" S<br>18° 14' 52.15" S<br>18° 08' 50.51" S<br>18° 06' 48.37" S | 118° 52' 22.75" E<br>118° 59' 59.16" E<br>119° 00' 0.79" E<br>119° 02' 2.23" E<br>119° 04' 26.12" E<br>119° 04' 24.71" E<br>119° 00' 1.11" E<br>118° 51' 3.88" E<br>118° 50' 10.82" E<br>118° 50' 9.08" E<br>118° 48' 58.02" E<br>118° 45' 16.49" E<br>118° 52' 22.75" E | 130-235 m |
| **Mestrel/Bancroft** | WA-541-P | 19° 16' 30.95" S<br>19° 07' 44.66" S<br>19° 11' 27.76" S<br>19° 11' 27.76" S<br>19° 04' 55.31" S<br>19° 04' 55.32" S | 118° 21' 51.47" E<br>118° 17' 50.93" E<br>118° 34' 17.72" E<br>118° 35' 04.54" E<br>118° 35' 04.53" E<br>118° 24' 39.26" E | 80-95 m |
| **Curie** | WA-541-P | 18° 33' 49.88" S<br>18° 50' 05.76" S<br>18° 50' 12.65" S<br>18° 33' 56.66" S<br>18° 33' 49.88" S | 118° 12' 46.60" E<br>118° 12' 53.56" E<br>117° 52' 23.61" E<br>117° 52' 18.61" E<br>118° 12' 46.60" E | 135-265 m |
| **Wallace** | WA-435-P | 18° 39' 54.5" S<br>18° 39' 52.96" S<br>18° 37' 35.32" S<br>18° 35' 6.28" S<br>18° 35' 0.88" S | 118° 32' 57.92" E<br>118° 19' 4.57" E<br>118° 19' 4.33" E<br>118° 26' 58.41" E<br>118° 33' 17.9" E | 135-155 m |

## Activity Purpose

The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region.

Importantly, the exploration and appraisal activities proposed to be undertaken are for the purpose of gathering geological and reservoir information to inform Santos' decision making on potential development opportunities.

Further, the number of wells proposed (seven in total) provides sufficient flexibility to undertake a robust exploration and appraisal campaign.

The exploration and appraisal wells are not planned to be drilled sequentially and so the term of this EP is set at five years to allow sufficient time for data processing and well construction planning cycles between exploration wells and appraisal wells.

Depending on the results of each well drilled, Santos will either continue drilling in the same location or move on to the next OA. As such, a single well or multiple wells may be drilled in any one OA, meaning not all the OAs will necessarily be drilled.

Bedout Basin has the potential to be the next integrated gas and liquids development off Western Australia. Exploration success during the Bedout exploration and appraisal drilling program will help inform a future development.



*Indicative examples of semi-submersible MODU (image on the left) and of a jack-up drill MODU (image on the right).*

## Defining the Environment that May Be Affected

In order to define the EMBA, we have considered the areas where impacts from planned activities and potential impacts from unplanned events that may occur. Activity impacts typically occur within Operational Areas (OAs), the location of which for proposed activities are summarised in **Table 3**.

The widest extent of these areas is called the Environment that May Be Affected (EMBA), which for this activity is the combined EMBA for the modelled potential worst-case hydrocarbon spill scenarios. This EMBA for proposed drilling activities is illustrated in **Figure 2**.

Spill EMBAs are defined by overlaying a great number (usually hundreds) of individual, computer simulated, hypothetical hydrocarbon spill events into a single map. Each simulation run starts from the same location (release point), but each run will be subject to a different set of wind and weather conditions derived from historical data.

The use of advanced and sophisticated models enables us to present all the areas that could be affected.

While the modelled EMBA represents the theoretical spatial extent that could be contacted by the worst-case spill event(s), an actual spill event is more accurately represented by a single simulation run, resulting in a much smaller spatial extent impacted by the spill.

Often, one or more simulation runs are selected to be representative of the 'worst-case' based on the nature and scale of the activity and the local environment. Please see the **NOPSEMA Spill Modelling Video** for more information on oil spill modelling and why it is required for the preparation of Environment Plans.

Santos has undertaken a review of publicly available information to identify environmental, social, economic and cultural values and sensitivities that may be affected by activity impacts and risks. The outcomes of this review are summarised in **Tables 3-6**.

## Table 3. Environmental values and sensitivities

| Value/Sensitivity | Description | Spatial overlap with OA | Spatial overlap with EMBA | Relevance to EP Activities |
|---|---|---|---|---|
| **Biologically Important Areas (BIAs)** | BIAs are spatially defined areas where aggregations of individuals of a species are known to display biologically important behaviour such as breeding, foraging, resting or migration. | Yes | Yes | The OAs overlap the following BIAs:<br>• Flatback turtle (internesting buffer): Mestrel/Bancroft OA.<br>• Lesser frigatebird (reproduction): Curie OA, Mestrel/Bancroft OA and Wallace OA.<br>• White-tailed tropicbird (reproduction): Ara OA, Curie OA, and Wallace OA.<br>• brown booby (reproduction): Mestrel/Bancroft OA.<br>• whale shark (feeding): all OAs.<br>The EMBA also includes BIAs for sharks, marine mammals and marine birds. |
| **Key Ecological Features (KEF)** | 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. | No | Yes | No KEFs intercept the OAs.<br>The nearest KEF to the OAs is the Ancient Coastline at 125 m Depth Contour KEF, which is located approximately 7 km south of Curie OA.<br>There are KEFs present within the EMBA. |

Table 3. Environmental values and sensitivities ... continued

| Value/Sensitivity | Description | Spatial overlap with OA | Spatial overlap with EMBA | Relevance to EP Activities |
|---|---|---|---|---|
| **Protected Areas** | World Heritage Areas (WHA)<br>Commonwealth Heritage Listed (CHL)<br>National Heritage Listed (NHL) | No | Yes | No WHAs, CHL or NHL areas intercept the Operational Areas.<br>The closest WHA to the Operational Areas, is the Ningaloo Coast WHA located approximately 473 km from the Curie Operational Area.<br>The EMBA contains:<br>•Two WHAs:<br>• Shark Bay<br>• The Ningaloo Coast<br>• Three NHL areas:<br>• Dampier Archipelago (including Burrup Peninsula)<br>• Shark Bay, Western Australia<br>• The Ningaloo Coast<br>• Four CHL areas:<br>• Learmonth Air Weapons Range Facility<br>• Mermaid Reef - Rowley Shoals<br>• Ningaloo Marine Area - Commonwealth Waters<br>• Scott Reef and Surrounds - Commonwealth Area |
| | Australian Marine Parks (AMP) | No | Yes | No AMPs intercept the OAs.<br>The nearest AMP to the Mestrel/Bancroft OA, is the Eighty Mile Beach AMP (48 km).<br>The Argo-Rowley Terrace is the closest AMP to:<br>• Ara at 40km<br>• Curie at 90km<br>• Wallace at 93km<br>Australian Marine Parks are present within the EMBA. |

Table 3. Environmental values and sensitivities ... continued

| Value/Sensitivity | Description | Spatial overlap with OA | Spatial overlap with EMBA | Relevance to EP Activities |
|---|---|---|---|---|
| **Protected Areas** | Western Australian Marine Parks and Marine Management Areas | No | Yes | There are no Western Australian Marine Parks or Marine Management Areas located within the OAs.<br>The Rowley Shoals Marine Park is the closest WA State Protected area, to the following OAs:<br>• 45km to Ara<br>• 120 km to Curie<br>• 101km to Wallace<br>Eighty Mile Beach Marine Park is the closest WA State Protected area to the Mestrel/Bancroft OA.<br>The EMBA has Western Australian Marine Parks and Marine Management Areas. |
| | Wetlands of International or National Importance | No | Yes | There are no Wetlands of International or National importance located within the OAs.<br>The closest Wetlands of National Importance to the OAs are:<br>• Eighty Mile Beach - located 133 km from Mestrel/Bancroft<br>• Leslie (Port Hedland) Saltfields System – located 113 km from Mestrel/Bancroft<br>• Mermaid Reef - located 127 km from Ara<br>No wetlands of international importance were identified within the EMBA.<br>Five wetlands of national importance were identified within the EMBA. |

### Table 4. Social values and sensitivities

| Value/Sensitivity | Description | Spatial overlap with OA | Spatial overlap with EMBA | Relevance to EP Activities |
|---|---|---|---|---|
| **Communities** | Local Government Area | No | Yes | No Local Government Areas intercept the Operational Areas.<br>The closest Local Government Area to the Operational Areas is the Town of Port Hedland, which is located approximately 123 km from Mestrel/Bancroft Operational Area.<br>There are seven Local Government Authorities near to the EMBA. |
| **Indigenous, subsistence or customary fishing** | Indigenous, subsistence or customary fishing areas | No | Yes | Traditional indigenous fishing in WA waters predominately occurs within inshore tidal waters and is not expected in the OAs.<br>Traditional indigenous fishing in WA waters may occur in the EMBA. |
| **Recreational fishing** | Recreational fishing areas | No | Yes | Recreational fishing is unlikely to occur within the OAs.<br>Recreational fishing is known to occur within the EMBA. |

**Table 5. Economic values and sensitivities**

| Value / Sensitivity | Description | Spatial overlap with OA | Spatial overlap with EMBA | Public Information Review |
|---|---|---|---|---|
| **Commercial fishing** | Commercial fishing (Cth) | Yes | Yes | Four Commonwealth managed fisheries overlap the OAs, none of which have had any recent activity within the OAs.<br>Commercial fishing in the North West Slope Trawl Fishery, Western Tuna and Billfish Fishery, Southern Bluefin Tuna Fishery, Western Skipjack Tuna Fishery and the Western Deepwater Trawl Fishery occurs within the EMBA. |
| | Commercial fishing (WA) | Yes | Yes | 10 Western Australian managed fisheries overlap the OAs of which the following fisheries have had recent activity:<br>• Mackerel Managed Fishery (Area 2) - Ara, Curie, Mestrel/ Bancroft and Wallace OAs<br>• Pilbara Demersal Scalefish Fisheries specifically the Pilbara Trawl Interim Managed Fishery) - Ara, Curie, Mestrel/Bancroft and Wallace OAs |
| **Defence** | Designated defence activity areas | No | Yes | The OAs do not intersect any designated defence activity areas.<br>The closest Defence Area to the OAs is the RAAF Base Learmonth, which is located around 350 km from the nearest OA (Curie).<br>The EMBA has a designated defence activity in near proximity. |

Table 5. Economic values and sensitivities ... continued

| Value / Sensitivity | Description | Spatial overlap with OA | Spatial overlap with EMBA | Public Information Review |
|---|---|---|---|---|
| **Energy Industry** | Offshore carbon capture and storage activities | No | Yes | The OAs do not intersect any Greenhouse Gas (GHG) assessment permits for offshore carbon capture and storage activities.<br>There is an offshore carbon capture and storage activity within the EMBA. |
| | Oil and gas activities | No | Yes | The OAs do not intersect any other oil and gas activity and associated infrastructure. The activity occurs in a particularly isolated area of the North West Shelf. There are currently no operating fields in the OAs.<br>There are oil and gas activities within the EMBA. |
| | Offshore renewables activities | No | No | The OAs do not intersect any Offshore Energy Infrastructure (OIE) licences for proposed offshore renewables activities.<br>The nearest OIE licence is located off the coast of Bunbury, more than 1,600 km from Mestrel/Bancroft OA.<br>There are no offshore renewables activities within the EMBA. |

Table 5. Economic values and sensitivities ... continued

| Value / Sensitivity | Description | Spatial overlap with OA | Spatial overlap with EMBA | Public Information Review |
|---|---|---|---|---|
| **Shipping** | AMSA shipping fairways and recorded vessel movements and shipping routes | Yes | Yes | Two OAs (Curie, and Mestrel/Bancroft) overlap shipping fairways. As such, vessel traffic may be encountered as commercial vessels transit through the region.<br>There are shipping fairways and vessel movements and shipping routes within the EMBA. |
| | Port areas | No | Yes | The OAs do not intersect any port authority boundaries. The EMBA intersects the port authority boundaries of two Pilbara Ports, these being Port of Dampier and Port of Port Hedland.<br>The closest port is the Port of Hedland, which is approximately 123 km from the nearest boundary of the Mestrel/Bancroft OA.<br>The EMBA intersects the Port Authority boundaries of two Pilbara Ports, these being Port of Dampier and Port of Port Hedland. The closest port is the Port of Hedland, which is approximately 123 km from the nearest boundary of the Mestrel/Bancroft Operational Area. |
| **Telecommunications infrastructure** | Subsea telecommunications cables | No | Yes | The OAs do not intersect any subsea telecommunications cables. The JASURAUS submarine communication cable runs up through Permit Area WA-435-P. Its capacity and major role was overtaken in 2000 by other subsea cables out of Australia. However, Telstra continues to manage the cable as it remains an emergency backup link out of Australia.<br>There are subsea telecommunications cables within the EMBA. |
| **Tourism** | Marine and coastal tourism | No | Yes | No known tourism activities occur in the OAs.<br>Tourism activities are known to occur in the EMBA. |

## Table 6. Cultural values and sensitivities

| Value / Sensitivity | Description | Spatial overlap with OA | Spatial overlap with EMBA | Public Information Review |
|---|---|---|---|---|
| **Aboriginal Heritage** | Registered Aboriginal Heritage sites protected under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)* | No | Yes | There are no registered Aboriginal Heritage sites within the OAs<br>Aboriginal Heritage sites are present along the southern and eastern boundaries of the EMBA. |
| | Registered Aboriginal Heritage sites protected under the *Aboriginal Heritage Act 1972 (WA)* | No | Yes | There are no registered sites within the OAs.<br>Aboriginal Heritage sites are present along the southern eastern boundaries of the EMBA. |
| **Cultural Heritage** | Registered cultural sites under the:<br>• *Underwater Cultural Heritage Act 2018 (Cth)*<br>• *Maritime Archaeology Act 1973 (WA)* | No | Yes | There are no known sites of shipwrecks, sunken aircraft or other types of underwater cultural heritage within the OAs using the "Australian National Shipwrecks" dataset (before it was removed last year – can still be viewed online).<br>The closest known shipwrecks to the OAs are the Pearl (lost at North Turtle Island) and the Lively (lost in 1806 at Mermaid Reef).<br>There are shipwrecks within the EMBA. |

Environmental impact and risk assessment considers planned activities and unplanned events:

- **Planned activities** come with unavoidable and known impacts that occur as part of the Activity, such as noise and atmospheric emissions.
- **Unplanned events** are not expected to occur, such as accidental discharges or spills. These events are assessed to ensure that, in the unlikely of an occurrence, the risks are managed adequately (through contingency measures).

**Table 4** summarises the potential environmental impacts, risks and associated management measures for the proposed Activity. Physical, biological, socio-economic and cultural aspects will be risk-assessed within the EP on a case-by-case basis, with proposed management measures listed in **Table 7** designed to reduce the environmental consequences to minor and As Low As Reasonably Practicable (ALARP).

## Table 7. Planned Activity impacts and management measures

| **Potential activity impacts** | |
|---|---|
| **Noise emissions** | |
| **Description of impacts**<br>Noise will be generated by:<br>• MODU operations (although MODUs have no repulsion removing any noise generated from propellers)<br>• Drilling operations<br>• Flaring<br>• Activity support and survey vessels<br>• Helicopters<br>Elevated underwater noise has the potential to change marine fauna behaviour such as attraction, avoidance and disorientation. The sensitivity of fauna to elevated noise levels varies depending on individual response.<br>Noise from drilling operations activities are not expected to impact socio-economic receptors as the impacts to fish from underwater noise are limited to localised behavioural changes that will not have any flow on impact to commercial fishing operations. | **Compliance with the following key management measures**<br>• Implement Santos' *Protected Marine Fauna Interaction and Sighting Procedure* for vessel and aircraft movements. This procedure limits marine fauna approach distances and speed, allowing marine fauna to be avoided or to move away which complies with Part 8 of *Environment Protection and Biodiversity Conservation Regulations* (EPBC Regulations) for interacting with cetaceans including:<br>  • Support vessels will not travel faster than 6 knots within 300 m of a cetacean or turtle (caution zone) and minimise noise;<br>  • Implement Santos' Protected Marine Fauna Interaction and Sighting Procedure;<br>  • Support vessels will not approach closer than 50 m to a dolphin or turtle and/or 100 m for a whale; and<br>  • Vessels' movements and helicopter flights comply with Part 8 of EPBC Regulations for interacting with cetaceans.<br>• Marine assurance standards and planned vessel maintenance will minimise noise generated from vessels and MODU by ensuring they are operated, maintained and crewed in accordance with industry standards and regulatory requirements.<br>• Vessel planned maintenance system to maintain vessel dynamic positioning engines and machinery<br>• Vessel bridge crew receive induction in marine fauna observations and marine fauna interaction requirements |

**Table 7. Planned Activity impacts and management measures ... continued**

| Light emissions | |
|---|---|
| **Description of impacts**<br>Light will be generated by:<br>• Flaring activities<br>• Artificial lighting for:<br>  • operational and navigational safety during the Activity;<br>  • spot lighting when needed, such as deploying or retrieving equipment; and<br>  • when ROVs are working underwater.<br>Light may impact threatened, migratory or local fauna (e.g. marine mammals, marine turtles, sharks, rays, other fish and seabirds) and socio-economic receptors (cultural features). For example, fish may be attracted to artificial light, leading to a short-term localised increase in fauna activity.<br>The vessels, including the MODU are expected to produce similar light levels to other marine vessels in the region. | **Compliance with the following key management measures**<br>• Lighting is to be limited to that required for safe operations and navigation and will comply with the following maritime regulations:<br>  • International Regulations for Preventing Collisions at Sea (COLREGS) / Marine Orders 30: Prevention of Collisions, and<br>  • Marine Orders 21: Safety of Navigation and Emergency Procedures.<br>The Commonwealth *National Light Pollution Guidelines for Wildlife (2023)* will be followed as reasonably practicable. |

**Table 7. Planned Activity impacts and management measures ... continued**

| Physical presence and interaction with other marine users | |
|---|---|
| **Description of impacts**<br>Interaction with other marine users may occur as a result of vessel or helicopter activities, including:<br>• Support vessels<br>• MODU<br>• Helicopters<br>For commercial fishing licence holders, the level of interaction could lead to temporary displacement to fishing grounds.<br>The presence of vessels could pose a navigational hazard and a collision risk. | **Compliance with the following key management measures**<br>• All project vessels operating within the OAs will adhere to the navigation safety requirements:<br>  • *International Regulations for Preventing Collisions at Sea 1972*,<br>  • Chapter 5 of *International Convention for the Safety of Life at Sea 1974*,<br>  • *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978*, and<br>  • the *Navigation Act 2012* and any subsequent Marine Orders that specify standards for crew training and competency, navigation, communication, and safety measures.<br>• The Australian Hydrographic Office will be advised of project activities and installed infrastructure to facilitate issuing Notices to Mariners and maintaining nautical charts.<br>• The MODU and activity vessels will maintain navigation aids to facilitate identification by other users.<br>• A 500 m exclusion zone will be established and maintained around all drilling activities.<br>• Exclusion zones/ petroleum safety zones will be limited to the minimum area necessary to exercise rights and perform duties under project specific petroleum titles.<br>• Residual impacts to other marine users of the environment are managed to not interfere with their rights.<br>• Lighting will be used as required for safe work conditions and navigational purposes<br>• Pre-lay anchors are marked with surface buoys when semisubmersible MODU is not connected |

**Table 7. Planned Activity impacts and management measures ... continued**

| Seabed and benthic (above seabed level) habitat disturbance | |
|---|---|
| **Description of impacts** | **Compliance with the following key management measures** |
| Seabed disturbance will occur by:<br>• MODU mooring (anchoring)<br>• Well construction<br>• Placement of objects on the seabed such as drilling equipment<br>Seabed disturbance could result in localised removal of epifauna or decreases in the abundance and diversity of local infauna.<br>The total area of seabed disturbance that has been calculated for the proposed activities:<br>• Grab sampling - 5m$^2$ per sample<br>• In OAs where the jack-up will be used: 950m$^2$ per well<br>• Pre-lay of MODU anchors in OAs where the semi-submersible will be used: 2,520 m$^2$ per well. | • The semi-submersible MODU anchor mooring design and station keeping system will be designed to limit the extent of seabed disturbance by minimising the length of mooring line deployed.<br>• No planned mooring of support vessels.<br>• All deployed equipment is to be recovered at the end of a drilling campaign to enable seabed and habitat recovery.<br>• Santos continues to consider risks and impacts to cultural values and additional control measures may be adopted following site surveys. |

**Table 7. Planned Activity impacts and management measures ... continued**

| Operational discharges - vessels | |
|---|---|
| **Description of impacts** | **Compliance with the following key management measures** |
| The types of vessel discharges are typical of most offshore commercial vessels and include:<br>• Bilge water<br>• Cooling water<br>• Deck drainage<br>• Desalination brine<br>• Food waste<br>• Sewage and greywater<br>• Ballast water<br>• Firefighting foam<br>• Discharges from the MODU and support vessels may create a localised and temporary reduction in marine water quality. | • Santos' chemical selection process will be implemented so that environmentally acceptable chemicals are used<br>• Additives will be selected and optimised for biodegradability as well as low aquatic toxicity and bioaccumulation potential<br>• All wastewater discharges will comply with relevant MARPOL 73/78, *Navigation Act 2012*, Protection of the Sea (Prevention of Pollution) Act 1983 and subsequent Marine Order requirements (as appropriate for vessel classification)<br>• Marine Order 91 (Marine Pollution Prevention – Oil), which implements Annex I of MARPOL 73/78<br>• Marine Order 95 (Marine Pollution Prevention – Garbage), which implements Annex V of MARPOL 73/78<br>• Marine Order 96 (Marine Pollution Prevention – Sewage), which implements Annex IV of MARPOL 73/78<br>• Santos Waste (Garbage) Management Procedures |

**Table 7. Planned Activity impacts and management measures ... continued**

| Operational discharges - drilling | |
|---|---|
| **Description of impacts** | **Compliance with the following key management measures** |
| The types of routine drilling discharges include:<br>• Brine<br>• Drilling muds, which will be water-based for this activity<br>• Drilling fluids and cuttings<br>• Subsea control fluids<br>• Cement and completion fluids (such as well clean up and suspension fluids)<br>• Formation water<br>• Chemicals such as tracer dyes<br>Drilling discharges will be intermittent during the activity with volumes discharged dependent on a range of variables. Drilling discharges to the marine environment will result in a localised (around the discharge location) and temporary (minutes to hours) reduction in water quality.<br>The OAs are in an area with strong tidal flows which characterise a high-energy, well mixed deep open water environment. The discharges are expected to be dispersed and diluted rapidly with concentrations significantly dropping the further away from the discharge location. Water quality change outside the OAs is therefore unlikely to occur. | • Chemical selection procedures so that only environmentally acceptable products are used in the activity<br>• Cuttings management system to ensure all drilling fluid will be recovered prior to the cuttings discharge to the sea<br>• Use only water-based mud as drilling fluid |

**Table 7. Planned Activity impacts and management measures ... continued**

| Atmospheric emissions | |
|---|---|
| **Description of impacts** | **Compliance with the following key management measures** |
| Atmospheric emissions will occur from:<br>• Fuel combustion to operate the MODU, vessels and helicopters<br>• Operation of vessel incinerators<br>• Flaring during well testing of appraisal wells<br>Atmospheric emission from the above activities may result in a temporary, localised reduction of air quality in the environment immediately surrounding the discharge point during the activity.<br>Non-GHG emissions (NOx and SOx), can lead to a reduction in local air quality.<br>Other atmospheric emissions may include greenhouse gases (GHG) such as $CO_2$, $N_2O$ and $CH_4$. GHG emissions are linked to global warming and climate change. | • The MODU and support vessels will comply with MARPOL Annex VI (Prevention of Air Pollution from Ships), the *Navigation Act 2012*, the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and subsequent Marine Orders, which require vessels to have a valid International Air Pollution Prevention Certificate (for vessels more than 400 tonnage), and to use low-sulphur fuel.<br>• Ozone-depleting substances onboard vessels and the facilities will comply with relevant MARPOL 73/78 (Annex VI - air pollution), *Navigation Act 2012*, *Protection of the Sea (Prevention of Pollution) Act 1983* and subsequent Marine Order requirements (as appropriate for vessel classification)<br>• Vessel preventative maintenance systems<br>• Measure, monitor or estimate fuel and flare emissions (in accordance with the National Pollutant Inventory)<br>• Emissions, energy consumption and energy production data will be reported annually to the Clean Energy Regulator by the vessel contractors in accordance with *National Greenhouse and Energy Reporting Act 2007* requirements<br>• Well flowback flaring is planned to be temporary and of short duration (approximately 2-3 days) and flowback procedures are to be adopted for effective flaring of hydrocarbons<br>• MODU planned maintenance system – reduces emissions by ensuring contracted MODU is operated, maintained and manned in accordance with industry standards and regulatory requirements<br>The control measures to be adopted are designed to be consistent with maritime regulations and petroleum industry standards. |

**Table 7. Planned Activity impacts and management measures ... continued**

| Potential activity risks | |
|---|---|
| **Unplanned introduction of invasive marine species (IMS)** | |
| **Description of risks** | **Compliance with the following key management measures** |
| Introduction of invasive marine species (IMS) may occur due to:<br>• Biofouling on vessels and external/internal niches (such as sea chests, seawater systems)<br>• Biofouling on equipment that is routinely submerged in water (such as ROVs)<br>• Discharge of high-risk ballast water<br>If successfully established, IMS can:<br>• Outcompete native species for food or space<br>• Prey on native species<br>• Change the nature of the environment<br>• Impact fisheries or aquaculture<br>• Impact human health through released toxins<br>• Reduce coastal aesthetics<br>• Cause damage to marine and industrial equipment and infrastructure | • Ballast water exchange operations will comply with the International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004 (as appropriate to vessel class), Australian Ballast Water Management Requirements (DAWE 2020), *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006*, and *Biosecurity Act 2015*, including:<br>  • all ballast water exchanges conducted more than 12 nm from land<br>  • vessel Ballast Water Management Plan stipulating that ballast water exchange records will be maintained Compliance with Santos IMS Management Plan<br>• Biofouling management for vessels will be in accordance with the IMO Guidelines.<br>• Compliance with the International Convention on the Control of Harmful Anti-fouling Systems on Ships 2001.<br>• Valid International Anti-Fouling Systems Certificate. |

**Table 7. Planned Activity impacts and management measures ... continued**

| Unplanned interaction with marine fauna | |
|---|---|
| **Description of risks**<br>Potential interaction with marine fauna may occur as a result of:<br>• MODU operations<br>• Vessel operations<br>• Helicopter operations<br>Marine fauna in surface waters that are most at risk from vessel collision include marine mammals, marine turtles and whale sharks.<br>The MODU is not self-propelled and will be stationary once on location and MODU related marine fauna interactions are not anticipated.<br>Potential strike or collision may result in severe injury or mortality. | **Compliance with the following key management measures**<br>• Monitoring of surrounding marine environment by support vessel(s).<br>• Santos' Procedure for interacting with marine fauna, which is designed to align with the EPBC Regulations 2000. This procedure limits marine fauna approach distances and speed, allowing marine fauna to be avoided or to move away.<br>• Vessels within the designated OA will adhere to the requirements of the EPBC Regulations Part 8.1 – Interacting with cetaceans, (except in emergency conditions or when manoeuvring is not possible), which include:<br>  • Implement a caution zone of 150 m for dolphins and 300 m for whales;<br>  • Vessels will not knowingly approach closer than 50 m to a dolphin and 100 m to a whale (i.e. no approach zone);<br>  • Make sure a vessel does not drift or approach within 50 m of a dolphin or 100 m of a whale; and<br>  • Vessels will not knowingly travel more than 6 knots within the caution zone of a dolphin or whale.<br>• Helicopters within the designated OA will adhere to the requirements of the EPBC Regulations Part 8.1 – Interacting with cetaceans (except in emergency conditions or when manoeuvring is not possible), which includes:<br>  • not operating the helicopter at a height lower than 1650 feet or within a horizontal radius of 500 m of a cetacean, and<br>  • not allowing the aircraft to approach a cetacean from head on.<br>• Vessel standard operating procedure. |

**Table 7. Planned Activity impacts and management measures ... continued**

| Unplanned release of solid objects | |
|---|---|
| **Description of risks** | **Compliance with the following key management measures** |
| Objects that could be accidentally released to the marine environment from vessels or during installation activities include:<br>• Non-hazardous solid wastes (paper, plastics and packaging)<br>• Hazardous solid wastes, (such as batteries, fluorescent tubes and aerosol cans)<br>• Equipment and materials (supplies, hard hats, tools or infrastructure parts)<br>Dropped objects from the MODU or support vessels may occur due to:<br>• Overfull or uncovered bins<br>• Incorrectly disposed items<br>• Incidents during transfers of waste or supplies<br>• Accidentally dropped objects/lost equipment<br>• Solid objects, equipment and other items lost at sea could lead to disturbance of benthic habitats in the area where the object has been dropped | • All wastewater discharges will comply with relevant MARPOL 73/78, *Navigation Act 2012*, *Protection of the Sea (Prevention of Pollution) Act 1983* and subsequent Marine Order requirements (as appropriate for vessel classification)<br>• Objects dropped overboard will be recovered where practicable to mitigate the environmental consequences from objects remaining in the marine environment, unless the environmental consequences are minor, or safety risks are disproportionate to the environmental consequences<br>• Waste management procedures will include:<br>• Classification of wastes including segregation of wastes into recyclable and non-recyclable materials<br>• Appropriate storage of wastes<br>• Transportation and disposal of wastes by a licenced waste contractor at licenced waste management facilities in accordance with waste classifications<br>• Crane and lifting operations will comply with the following:<br>• Lifting equipment will be inspected and certified<br>• Preventative maintenance will be carried out, and lifting operators will be competent and qualified |

**Table 7. Planned Activity impacts and management measures ... continued**

| Unplanned hazardous liquid release (non-hydrocarbon) | |
|---|---|
| **Description of risks** | **Compliance with the following key management measures** |
| Unplanned hazardous liquid release (non-hydrocarbon) may occur during:<br>• Transferring, storing or using bulk products (e.g., mixed cement)<br>• Mechanical failure of equipment, such as a tank or pipework failure<br>• Handling and storage spill and leaks due to insufficient fastening<br>• Hose or hose connection failure or leak<br>• Lifting – dropped objects damaging liquid vessels (containers) inadequate bunding<br>Non-hydrocarbon liquids include miscellaneous chemicals and waste streams (brine, mixed cement, cleaning and cooling agents, stored or spent chemicals and leftover paint materials) used or stored on board activity vessels, including the MODU.<br>• Impacts to water quality are expected to be short-term and localised due to the selection of environmentally acceptable chemicals, the relatively small size of an unplanned spill and the rapid dispersal.<br>• A decrease in water quality is likely to be restricted to the immediate area surrounding the spill location and contained within the OA.<br>• Due to the small volumes and expected rapid dilution to concentrations below impact thresholds, impacts to water quality are not expected to cause flow-on effects to sediment quality, benthic habitats or socio-economic receptors such as commercial fisheries and/or cultural features. | Santos has a suite of procedures to manage the selection, storage, handling and clean-up of chemicals and other non-hydrocarbon liquids.<br>All project vessels operating within the OAs will adhere to the navigation safety requirements including:<br>• International Regulations for Preventing Collisions at Sea 1972<br>• Chapter 5 of International Convention for the Safety of Life at Sea 1974<br>• International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978<br>• the *Navigation Act 2012* and any subsequent Marine Orders that specify standards for training and competency, navigation, communication, and safety measures<br>• All vessels involved in the project will have a valid SOPEP or Shipboard Marine Pollution Emergency Plan (as appropriate for vessel classification). Vessels will have spill response plans.<br>• Santos chemical selection process will be implemented so that environmentally acceptable chemicals are used<br>• All project vessels subject to Santos' marine assurance procedures ensuring contracted vessels are operated, maintained and crewed in accordance with industry standards and regulatory requirements<br>• A 500 m exclusion zone will be established and maintained around the drilling activities.<br>• Spill kits will be available on-board vessels and personnel will receive an induction/training to inform them of deck spill response requirements.<br>• Chemical storage areas will typically be set up in cabinets or bunded storage areas<br>• Vessel lifting standards and cargo transfer procedures<br>• Hydraulic equipment on board vessels will be subject to routine servicing and inspection to ensure it is fit for purpose. |

**Table 7. Planned Activity impacts and management measures ... continued**

| Unplanned minor hydrocarbon release | |
|---|---|
| **Description of risks** | **Compliance with the following key management measures** |
| Unplanned minor hydrocarbon release may occur due to:<br>• ROV failure<br>• Loss of primary containment<br>• Pipework failure or rupture, hydraulic hose failure<br>• Lifting – dropped objects damaging diesel infrastructure<br>• Human error during tank filling or storage container transfers<br>Minor releases refer to relatively small volumes of hydrocarbons from storage containers, transfer equipment and pipework on the MODU or support vessels that enters the marine environment. Most of these types of release occur within bunded deck areas, and are less than $1m^3$, however it remains possible for such spills to enter the marine environment.<br>A localised decrease in water quality may occur, however due to the relatively small volumes impacts are expected to be short term as the hydrocarbon would rapidly dilute and dissolve into the ocean.<br>Marine fauna may transit through the OAs and encounter the release. However, it is expected impacts to fauna would be short term and result in behavioural changes, as they move away from the area where the spill occurred.<br>Minor hydrocarbon releases are not expected to impact any socio-economic receptors such as commercial fisheries and/or cultural features. | • Dropped object prevention procedures to reduce the potential for dropped objects during lifting operations (including tote tanks and drum lifts)<br>• Hazardous chemical management procedures to reduce the potential of spills and leaks (discharges) to the marine environment by controlling the storage, handling and clean-up of hazardous chemicals<br>• General chemical management procedures to reduce spills, leaks and discharges by implementing procedures for the safe handling and storage of chemicals<br>• Dangerous goods managed in accordance with International Maritime Dangerous Goods Code to reduce the potential of an accidental minor spills<br>• MODUs and vessels have spill response plans<br>• Remotely operated vehicle (ROV) inspection and maintenance procedures<br>• Documented maintenance program is in place for equipment on vessels and MODU that provides a status on the maintenance of equipment<br>• Emergency response capability (including equipment, personnel contracts, MOUs) will be maintained in accordance with approved SOPEPS accepted EPs and OPEPs<br>• Bulk liquid transfer procedure to provide detail about chemical bunkering processes being undertaken<br>• Well test procedures to reduce the risk of hydrocarbons being released to sea and air |

**Table 7. Planned Activity impacts and management measures ... continued**

| Unplanned marine diesel oil (MDO) release | |
|---|---|
| **Description of risks**<br>An unplanned release of MDO to the marine environment could occur from:<br>• A collision between the activity vessels and an errant third-party vessel due to factors such as human error, poor navigation, vessel equipment failure or poor weather. Such events could have sufficient impact to result in the rupture of a diesel tank leading to a loss of integrity and releasing 325 $m^3$ in the environment. This is considered credible given the diesel tanks may not be protected or double-hulled and fuel tank ruptures resulting in a hydrocarbon release have occurred before within the maritime industry.<br>• Vessel - MODU Refuelling:<br>  • spills during refuelling can occur through several pathways, including fuel hose breaks, coupling failure or tank overfilling, where fuel bunkering would need to be stopped manually.<br>  • Fuel released prior to the cessation of pumping as well as fuel remaining in the transfer line may escape to the environment releasing 37.5$m^3$ of MDO.<br>Potential impacts that may occur as a result of hydrocarbon exposure could include:<br>• Sub-lethal stress and, in some cases, total or partial mortality of sensitive benthic organisms (e.g., corals) and the early life stages of resident fish and invertebrate species.<br>• A reduction in water quality has the potential to impact marine fauna. Some species of marine fauna may have cultural significance.<br>• Seabirds that encounter sea surface hydrocarbons may experience secondary effects through ingestion of condensate after eating exposed fish or preening.<br>Potential for temporary disruption to fishing activities e.g. disruption/ displacement of fishing activities caused by the physical presence of the slick, loss of catch, decline in commercially important fish stocks and/or suspension of fishing operations | **Compliance with the following key management measures**<br>• Bulk liquids transferred in accordance with the bulk transfer procedure to reduce the risk of a release to sea.<br>• MODUs and vessels have spill response plans.<br>• Remotely operated vehicle (ROV) inspection and maintenance procedures.<br>• Documented maintenance program is in place for equipment on vessels and MODU that provides a status on the maintenance of equipment.<br>All project vessels operating within the OA will adhere to the navigation safety requirements including:<br>• International Regulations for Preventing Collisions at Sea 1972,<br>• Chapter 5 of International Convention for the Safety of Life at Sea 1974,<br>• International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, and<br>• the *Navigation Act 2012* and any subsequent Marine Orders that specify standards for crew training and competency, navigation, communication, and safety measures.<br>• The AHS will be advised of project activities to facilitate issuing Notices to Mariners and maintaining nautical charts prior to commencement of installation or drilling activities and operations.<br>• At least one support vessel on standby at all times to monitor the MODU 500 m exclusion zone to identify approaching third-party vessels and communicate with the vessels.<br>• Accepted EP/OPEP in place for all Bedout drilling activities.<br>• A 500 m exclusion zone will be established and maintained around the drilling activities.<br>• Oil-spill modelling and environmental risk assessments for development of Bedout Drilling EP and OPEP will consider the full range of credible worst-case scenario consequences based on best available oil-spill modelling.<br>• The MODU and vessels will maintain navigation aids.<br>• Santos will undertake consultation with relevant persons for all petroleum activities within the scope of these activities in accordance with the OPGGS (E) Regulations. |

**Table 7. Planned Activity impacts and management measures ... continued**

| Unplanned hydrocarbon release from loss of well control during drilling | |
|---|---|
| **Description of risks**<br>Based on industry statistics and Santos' risk assessments, the likelihood of a loss of well control event leading to a spill of this size is considered 'remote' – requires exceptional circumstances and is unlikely even in the long term.<br>The combination of the standard prevention control measures (i.e., safe drilling methods), and the spill response strategies, as presented in the OPEP, together reduce the hydrocarbon spill risk to a low level<br>Potential impacts that may occur as a result of hydrocarbon exposure could include:<br>• Sub-lethal stress and, in some cases, total or partial mortality of sensitive benthic organisms (e.g., corals) and the early life stages of resident fish and invertebrate species.<br>• A reduction in water quality has the potential to impact marine fauna. Some species of marine fauna may have cultural significance.<br>• Seabirds that encounter sea surface hydrocarbons may experience secondary effects through ingestion of condensate after eating exposed fish or preening.<br>• Potential for temporary disruption to fishing activities e.g. disruption/ displacement of<br>• Fishing activities caused by the physical presence of the slick, loss of catch, decline in commercially important fish stocks and/or suspension of fishing operations | **Compliance with the following key management measures**<br>• Industry standard safe drilling methodologies, including inherently safe well designs and well control measures, are to be implemented<br>• Drilling and Completions Management Process, including well integrity standards and NOPSEMA accepted Well Operations Management Plan (WOMP)<br>• Safety options have been considered in well design and equipment choice for the activity<br>• MODU and support vessel spill response plans including predrilling source control plan<br>• A 500 m exclusion zone will be established and maintained around the drilling activities<br>• Oil-spill modelling and environmental risk assessments for development of Bedout Drilling EP and OPEP will consider the full range of credible worst-case scenario consequences based on best available oil-spill modelling<br>• The AHS will be advised of project activities to facilitate issuing Notices to Mariners and maintaining nautical charts prior to commencement of installation or drilling activities and operations<br>• Marine assurance standards and planned maintenance to ensure that MODU and vessels are operated, maintained and crewed in accordance with industry standards and regulatory requirements<br>• Documented maintenance program is in place for equipment on MODU that provides a status on the maintenance of equipment<br>• Prior to each campaign commencement, an assurance check will be undertaken in accordance with Santos Environment Management of Change Procedure<br>• Prior to the drilling there will be a source control plan in place<br>• Source control emergency response plans in place for all drilling activities, including but not limited to:<br>  • Relief Well Drilling; and<br>  • Activation of Blow-out preventer stack. |

## Consultation

In preparing an EP for submission to NOPSEMA, a titleholder must consult with each 'relevant person', including relevant Commonwealth and State Departments or agencies, and persons (or organisations) whose functions, interests or activities may be affected by the activity proposed to be carried out under an EP.

Your input is important:

- So that Santos can understand the environmental values in the OAs and the EMBA, and the environmental impacts and risks associated with the Activity to inform development of the Bedout Multi-Well Exploration and Appraisal Drilling EP;
- To inform Santos how consultation processes may need to be adapted for different relevant persons; and
- To ensure that Santos provides information to relevant persons in an appropriate and accessible manner.

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

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

This feedback helps Santos to refine or change the management measures it plans to address any potential activity impacts and risks. Santos' objective for the proposed activities will be carried out in a manner by which the environmental impacts and risks of the activity will be reduced to a level that is ALARP and acceptable over the life of the Activity.

## Providing feedback

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

Relevant persons being consulted on EPs under the OPGGS Environment Regulations should note that they:

- are entitled to be given sufficient information to allow them to make an informed assessment of the possible consequences of the activity on their functions, interests or activities;
- are entitled to be allowed a reasonable period for the consultation; and
- may request particular information provided in consultation not be published.

If you consider you may be a relevant person, please contact us to initiate consultation with you, so you can tell us how you would like to be consulted throughout the consultation process or if you need additional information. Consultation dates for proposed activities are published on Santos' Consultation Hub website.

The merits of relevant person feedback provided through the consultation process will be considered during the EP development with a summary of responses summarised and included in the EP submitted to NOPSEMA for assessment. Please let us know if you would like your personal/organisational details or any particular information provided during consultation to not be published, and we will ensure that it is included in a separate report which is not published on NOPSEMA's website.

More information about how community members can participate in environmental approvals for activities proposed in Commonwealth waters has been published in a **brochure** by NOPSEMA.

Environment plans for offshore petroleum exploration activities are also subject to a mandatory public comment period. Public comment must be done before the environment plan is submitted to NOPSEMA for assessment.

**Contact** **E:** offshore.consultation@santos.com **T:** 1800 267 600 **santos.com/offshoreconsultation**

Information for commercial fishers

Santos

# Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

## Information overview

Santos is proposing to undertake a multi-well exploration and appraisal drilling program within Commonwealth waters of the Bedout Basin.

Santos has a long history of hydrocarbon exploration, development and operations offshore northern Western Australia, including in the Bedout Basin where Santos, over many years, has successfully undertaken exploration and appraisal activities.

Bedout Basin has the potential to be the next major liquids rich gas led development off Western Australia. The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region. Exploration success during the Bedout exploration and appraisal drilling program will help inform a future development.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

Santos is seeking input from commercial fishers by **22 August 2025**.

Details on fisheries Santos has assessed as being active in the Operational Areas (OAs) are included in **Table 1**.

Details on consultation and providing input can be found on the back page of this fact sheet. Pre and post activity notifications are also available upon request.

General fact sheets on proposed activities in Commonwealth waters and WA State land and waters, including potential environmental impacts risks and associated management measures, can be found at **www.santos.com/offshoreconsultation**

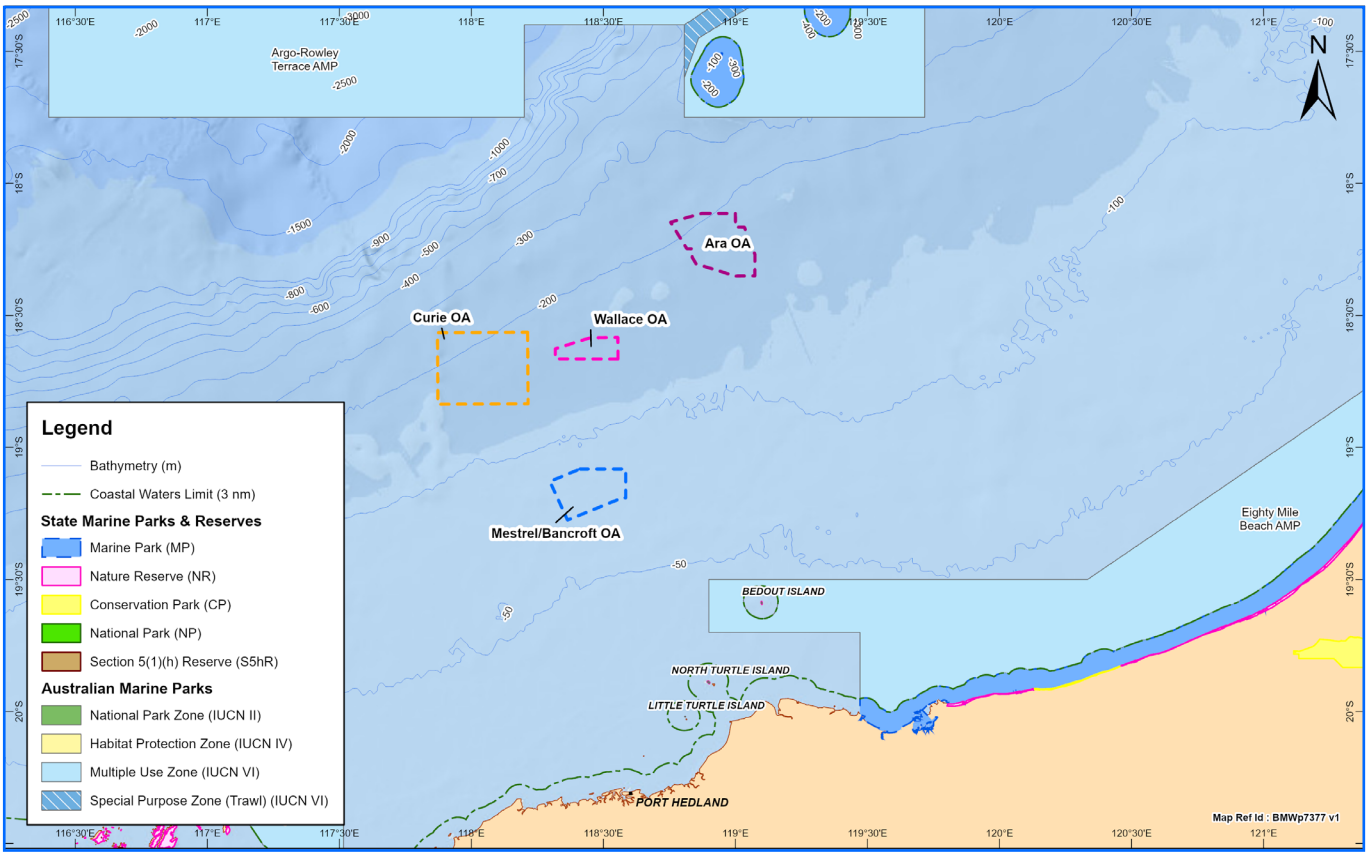



***Figure 1.*** *Bedout Operational Areas, Marine Parks & Reserves.*

## Activity description

| Activity details | | |
|---|---|---|
| **Proposed activity** | The drilling of up to 7 (exploration and/or appraisal) wells across four Operational Areas (OAs). | |
| **Activity purpose** | The purpose of the drilling program is to identify hydrocarbon resources additional to Santos' known discoveries in the region. | |
| **OA location** | The closest OA to the WA mainland – Mestrel/Bancroft – is approximately 123 km north of Port Hedland, WA. | |
| **Water depth** | **OA** | **Water depth** |
| | Ara | 130 m - 235 m |
| | Curie | 135 m - 265 m |
| | Mestrel/Bancroft | 80 m - 95 m |
| | Wallace | 136 m - 242 m |
| **Anticipated timing and duration*** | Drilling and appraisal activities may occur any time between Q2 2026 and Q2 2031, subject to obtaining all regulatory and business approvals. Expected duration to drill each well between 40 to 110 days, with drilling duration subject to change based on geological conditions and potential for operational challenges. | |
| **Exclusion zones** | A 500 m radius Petroleum Safety Zone (PSZ) exclusion zone will be in place around the MODU for the duration of the activity as a safety requirement to protect other marine users who might be in the area.<br>A 2,000 m cautionary zone will be established during anchor handling operations (for 2-3 days either side of rig arrival and departure). | |

* Timing and duration of proposed activities are subject to change based on regulatory approvals, rig availability, adverse weather conditions or technical/equipment issues that may arise during operations.

## Considerations for Commercial Fishers

Santos has undertaken an assessment to define the environmental, social, economic and cultural aspects that may be affected by proposed activities. To do this we have considered the totality of the area where activity impacts and risks may occur.

The widest extent of this area is called the Environment that May Be Affected (EMBA), which for this activity is a combined EMBA for the modelled potential worst-case hydrocarbon spill scenarios resulting from a loss of well control during drilling.

**Table 1** provides an overview of those fisheries that spatially overlap the OA and the EMBA.

These fisheries have been assessed to determine potential for interaction with proposed activities in the OA (see highlighted fisheries).

Santos' assessment was based on publicly available government managed catch and effort data, our ongoing discussions with commercial fisheries representative organisations, and historic engagements for previous petroleum activities.

OA coordinates can be found in **Table 2**.

**Table 1. Commercial fishery assessment**

| | Fishery spatial overlap with Operational Areas | Fishery spatial overlap with EMBA |
|---|---|---|
| **Commonwealth Fishery** | | |
| North West Slope Trawl Fishery | Yes | Yes |
| Southern Bluefin Tuna Fishery | Yes | Yes |
| Western Deepwater Trawl Fishery | No | Yes |
| Western Skipjack Tuna Fishery | Yes | Yes |
| Western Tuna and Billfish Fishery | Yes | Yes |
| **Western Australian Fishery** | | |
| Abalone Managed Fishery | Yes | Yes |
| Exmouth Gulf Prawn Managed Fishery | Yes | Yes |
| Gascoyne Demersal Scalefish Managed Fishery | No | Yes |
| Mackerel Managed Fishery | Yes | Yes |
| Marine Aquarium Fish Managed Fishery | Yes | Yes |
| Nickol Bay Prawn Managed Fishery | Yes | Yes |
| Onslow Prawn Managed Fishery | No | Yes |
| Pearl Oyster Managed Fishery | Yes | Yes |
| Pilbara Demersal Scalefish Fisheries (includes trawl, trap and line fisheries) | | |
| • Pilbara Line Fishery | Yes | Yes |
| • Pilbara Trap Managed Fishery | Yes | Yes |
| • Pilbara Fish Trawl Interim Managed Fishery | Yes | Yes |
| Pilbara Developmental Crab Managed Fishery | Yes | Yes |
| Sea Cucumber Fishery | No | Yes |
| Shark Bay Crab Managed Fishery | No | Yes |
| Shark Bay Prawn Managed Fishery | No | Yes |
| Shark Bay Scallop Managed Fishery | No | Yes |
| South-West Coast Salmon Fishery | Yes | Yes |
| Specimen Shell Managed Fishery | Yes | Yes |
| West Coast Rock Lobster Managed Fishery | No | Yes |
| West Coast Deep Sea Crustacean Managed Fishery | Yes | Yes |

**Table 2. Operational Area coordinates**

| OA | Latitude | Longitude |
|---|---|---|
| **Ara** | 18° 06’ 48.37” S<br>18° 06’ 50.13” S<br>18° 09’ 57.85” S<br>18° 09’ 59.04” S<br>18° 16’ 9.73” S<br>18° 21’ 1.9” S<br>18° 21’ 4.72” S<br>18° 18’ 17.64” S<br>18° 16’ 48.18” S<br>18° 14’ 53.53” S<br>18° 14’ 52.15” S<br>18° 08’ 50.51” S<br>18° 06’ 48.37” S | 118° 52’ 22.75” E<br>118° 59’ 59.16” E<br>119° 00’ 0.79” E<br>119° 02’ 2.23” E<br>119° 04’ 26.12” E<br>119° 04’ 24.71” E<br>119° 00’ 1.11” E<br>118° 51’ 3.88” E<br>118° 50’ 10.82” E<br>118° 50’ 9.08” E<br>118° 48’ 58.02” E<br>118° 45’ 16.49” E<br>118° 52’ 22.75” E |
| **Curie** | 18° 33’ 49.88” S<br>18° 50’ 05.76” S<br>18° 50’ 12.65” S<br>18° 33’ 56.66” S<br>18° 33’ 49.88” S | 118° 12’ 46.60” E<br>118° 12’ 53.56” E<br>117° 52’ 23.61” E<br>117° 52’ 18.61” E<br>118° 12’ 46.60” E |
| **Mestrel/Bancroft** | 19° 16’ 30.95” S<br>19° 07’ 44.66” S<br>19° 11’ 27.76” S<br>19° 11’ 27.76” S<br>19° 04’ 55.31” S<br>19° 04’ 55.32” S | 118° 21’ 51.47” E<br>118° 17’ 50.93” E<br>118° 34’ 17.72” E<br>118° 35’ 04.54” E<br>118° 35’ 04.53” E<br>118° 24’ 39.26” E |
| **Wallace** | 18° 39’ 54.53” S<br>18° 39’ 52.96” S<br>18° 37’ 35.32” S<br>18° 35’ 6.28” S<br>18° 35’ 0.88” S | 118° 32’ 57.92” E<br>118° 19’ 4.57” E<br>118° 19’ 4.33” E<br>118° 26’ 58.41” E<br>118° 33’ 17.9” E |

## Consultation

In preparing an EP for submission to NOPSEMA, a titleholder must consult with each 'relevant person', including relevant Commonwealth and State Departments or agencies, and persons (or organisations) whose functions, interests or activities may be affected by the activity proposed to be carried out under an EP.

Your input is important:

- So that Santos can understand the environmental values in the OAs and the EMBA, and the environmental impacts and risks associated with the Activity to inform development of the Bedout Multi-Well Exploration and Appraisal Drilling EP;
- To inform Santos how consultation processes may need to be adapted for different relevant persons; and
- To ensure that Santos provides information to relevant persons in an appropriate and accessible manner.

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

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

This feedback helps Santos to refine or change the management measures it plans to address any potential activity impacts and risks. Santos' objective for the proposed activities will be carried out in a manner by which the environmental impacts and risks of the activity will be reduced to a level that is ALARP and acceptable over the life of the Activity.

## Providing feedback

Santos is seeking your input in the proposed activities. Please contact us at the earliest opportunity. Formal consultation closes on **22 August 2025**.

The merits of relevant person feedback provided through the consultation process will be considered during EP development with a summary of responses included in the EP submitted to NOPSEMA for assessment. Please let us know if you would like your personal/organisational details or any part of your feedback to not to be published and we will ensure that it is not.

More information about how community members can participate in environmental approvals for activities proposed in Commonwealth waters has been published in a **brochure** by NOPSEMA.

EPs for offshore petroleum exploration activities are also subject to a mandatory public comment period. Public comment must be done before the environment plan is submitted to NOPSEMA for assessment.

## Contact

**E:** offshore.consultation@santos.com
**T:** 1800 267 600
**santos.com/offshoreconsultation**

# Advertising

SEEKING RELEVANT PERSONS

# Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

Santos

**Santos is seeking to consult with relevant persons whose functions, interests or activities may be affected by proposed activities offshore north-west of Western Australia in Commonwealth waters that will be managed under the: Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. The environment plan (EP) is required to support regional exploration and appraisal activities to identify hydrocarbon resources additional to Santos' known discoveries in the region.**

The EP allows for the drilling of up to seven wells in four Operational Areas (OAs) with the closest located approximately 123 km north of Port Hedland.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

The Environment Plan (EP) being prepared for the proposed activities, once accepted, is valid for five years, and will allow for the drilling of up to seven exploration/appraisal wells across four Operational Areas (OAs).

## The environment that may be affected (EMBA) by proposed activities

Santos is assessing impacts and risks of the proposed activities on ecosystems (including people and communities), natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places with the Environment that may be affected (EMBA). This will include assessment of the social, economic and cultural features of the environment.

The map below depicts Operational Areas for proposed activities and the EMBA. The EMBA represents the greatest spatial extent that could be affected by unplanned 'worst case' spill scenarios, before any measures to reduce risk are considered.

Santos is proposing to implement measures to reduce the impacts and risks of the activities. It is a requirement under relevant environmental legislation that these impacts and risks are reduced to as low as reasonably practicable (ALARP) and to an acceptable level.

## Seeking Relevant Persons for Environment Plans

All petroleum activities in Commonwealth waters must have an EP accepted by NOPSEMA before they can take place.

Under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth), Santos is required to consult with relevant persons and organisations who have functions, interests or activities that may be affected by the proposed activities. Function, interests or activities include those arising in relation to spiritual or cultural connections to land and sea country in accordance with Indigenous tradition; tourism; recreational and commercial fishing; other commercial or recreational activities and local communities that might be affected by our proposed activity (these are examples and not an exhaustive list).

Your input is important to Santos:

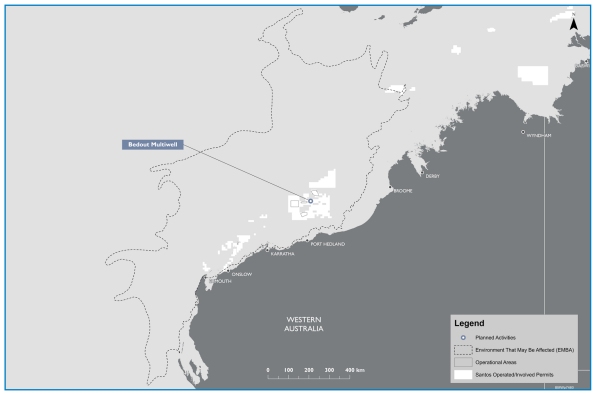
- so that we can understand the environmental values in the OAs and the EMBA, the environmental impacts and risks associated with the activities;
- to inform how consultation processes may need to be adapted for different relevant persons;
- to ensure that we provide information to people in an appropriate and accessible manner; and
- to assist with Santos' preparation of the EP.

More information on the proposed activities is available on our website **santos.com/offshoreconsultation/bedout**

## We welcome your input

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

This feedback helps us to refine or change the management measures we are planning to address potential activity impacts and risks.




*Santos Offshore: Western Australia Activity Map.*

Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is ALARP and acceptable over the life of the activity.

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

We have prepared consultation fact sheets which includes information about planned activities, identified environmental, social, economic and cultural aspects within the operational areas and EMBA and how we propose to manage impacts and risks.

## Contact us

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

If you consider you may be a relevant authority or other relevant interested persons or organisations, please contact us at the earliest opportunity to allow Santos to initiate consultation with you in relation to proposed activities and so you can tell us how you would like to be consulted throughout this process. Formal consultation closes on **22 August 2025**.

Santos is committed to undertaking genuine and meaningful consultation. We want to provide information for people to make informed assessments of the possible consequences of the proposed activity on them.

Your feedback and input are important to us and input will be considered in the development of our EPs.

Visit: **www.santos.com/offshoreconsultation**

Phone: **1800 267 600**

Email: **offshore.consultation@santos.com** for more information, to self-identify or to provide feedback.

SEEKING RELEVANT PERSONS

# Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

Santos

**Santos is seeking to consult with relevant persons whose functions, interests or activities may be affected by proposed activities offshore north-west of Western Australia in Commonwealth waters that will be managed under the: Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. The environment plan (EP) is required to support regional exploration and appraisal activities to identify hydrocarbon resources additional to Santos' known discoveries in the region.**

The EP allows for the drilling of up to seven wells in four Operational Areas (OAs) with the closest located approximately 123 km north of Port Hedland.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

The Environment Plan (EP) being prepared for the proposed activities, once accepted, is valid for five years, and will allow for the drilling of up to seven exploration/appraisal wells across four Operational Areas (OAs).

## The environment that may be affected (EMBA) by proposed activities

Santos is assessing impacts and risks of the proposed activities on ecosystems (including people and communities), natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places with the Environment that may be affected (EMBA). This will include assessment of the social, economic and cultural features of the environment.

The map below depicts Operational Areas for proposed activities and the EMBA. The EMBA represents the greatest spatial extent that could be affected by unplanned 'worst case' spill scenarios, before any measures to reduce risk are considered.

Santos is proposing to implement measures to reduce the impacts and risks of the activities. It is a requirement under relevant environmental legislation that these impacts and risks are reduced to as low as reasonably practicable (ALARP) and to an acceptable level.

## Seeking Relevant Persons for Environment Plans

All petroleum activities in Commonwealth waters must have an EP accepted by NOPSEMA before they can take place.

Under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth), Santos is required to consult with relevant persons and organisations who have functions, interests or activities that may be affected by the proposed activities. Function, interests or activities include those arising in relation to spiritual or cultural connections to land and sea country in accordance with Indigenous tradition; tourism; recreational and commercial fishing; other commercial or recreational activities and local communities that might be affected by our proposed activity (these are examples and not an exhaustive list).

Your input is important to Santos:

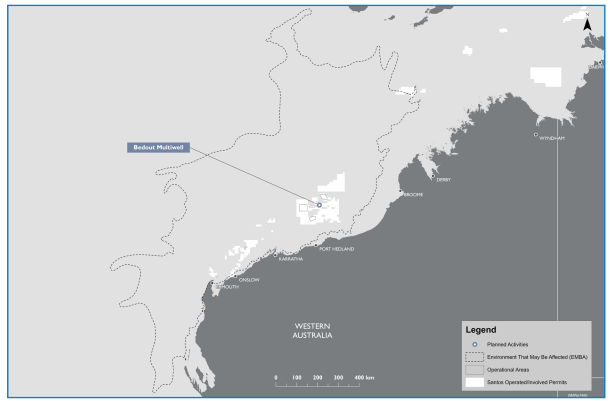
- so that we can understand the environmental values in the OAs and the EMBA, the environmental impacts and risks associated with the activities;
- to inform how consultation processes may need to be adapted for different relevant persons;
- to ensure that we provide information to people in an appropriate and accessible manner; and
- to assist with Santos' preparation of the EP.

More information on the proposed activities is available on our website **santos.com/offshoreconsultation/bedout**

## We welcome your input

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

This feedback helps us to refine or change the management measures we are planning to address potential activity impacts and risks.




*Santos Offshore: Western Australia Activity Map.*

Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is ALARP and acceptable over the life of the activity.

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

We have prepared consultation fact sheets which includes information about planned activities, identified environmental, social, economic and cultural aspects within the operational areas and EMBA and how we propose to manage impacts and risks.

## Contact us

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

If you consider you may be a relevant authority or other relevant interested persons or organisations, please contact us at the earliest opportunity to allow Santos to initiate consultation with you in relation to proposed activities and so you can tell us how you would like to be consulted throughout this process. Formal consultation closes on **22 August 2025**.

Santos is committed to undertaking genuine and meaningful consultation. We want to provide information for people to make informed assessments of the possible consequences of the proposed activity on them.

Your feedback and input are important to us and input will be considered in the development of our EPs.

Visit: **www.santos.com/offshoreconsultation**

Phone: **1800 267 600**

Email: **offshore.consultation@santos.com** for more information, to self-identify or to provide feedback.

SEEKING RELEVANT PERSONS

# Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

Santos

**Santos is seeking to consult with relevant persons whose functions, interests or activities may be affected by proposed activities offshore north-west of Western Australia in Commonwealth waters that will be managed under the: Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. The environment plan (EP) is required to support regional exploration and appraisal activities to identify hydrocarbon resources additional to Santos' known discoveries in the region.**

The EP allows for the drilling of up to seven wells in four Operational Areas (OAs) with the closest located approximately 123 km north of Port Hedland.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

The Environment Plan (EP) being prepared for the proposed activities, once accepted, is valid for five years, and will allow for the drilling of up to seven exploration/appraisal wells across four Operational Areas (OAs).

## The environment that may be affected (EMBA) by proposed activities

Santos is assessing impacts and risks of the proposed activities on ecosystems (including people and communities), natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places with the Environment that may be affected (EMBA). This will include assessment of the social, economic and cultural features of the environment.

The map below depicts Operational Areas for proposed activities and the EMBA. The EMBA represents the greatest spatial extent that could be affected by unplanned 'worst case' spill scenarios, before any measures to reduce risk are considered.

Santos is proposing to implement measures to reduce the impacts and risks of the activities. It is a requirement under relevant environmental legislation that these impacts and risks are reduced to as low as reasonably practicable (ALARP) and to an acceptable level.

## Seeking Relevant Persons for Environment Plans

All petroleum activities in Commonwealth waters must have an EP accepted by NOPSEMA before they can take place.

Under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth), Santos is required to consult with relevant persons and organisations who have functions, interests or activities that may be affected by the proposed activities. Function, interests or activities include those arising in relation to spiritual or cultural connections to land and sea country in accordance with Indigenous tradition; tourism; recreational and commercial fishing; other commercial or recreational activities and local communities that might be affected by our proposed activity (these are examples and not an exhaustive list).

Your input is important to Santos:

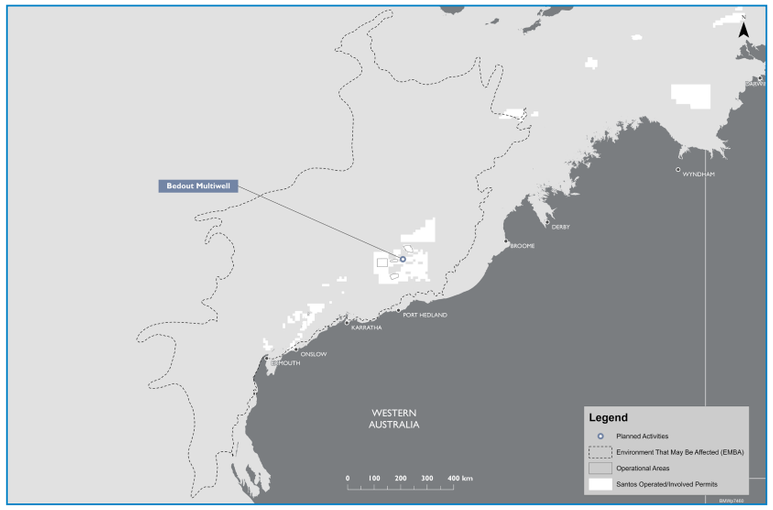
- so that we can understand the environmental values in the OAs and the EMBA, the environmental impacts and risks associated with the activities;
- to inform how consultation processes may need to be adapted for different relevant persons;
- to ensure that we provide information to people in an appropriate and accessible manner; and
- to assist with Santos' preparation of the EP.

More information on the proposed activities is available on our website **santos.com/offshoreconsultation/bedout**

## We welcome your input

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

This feedback helps us to refine or change the management measures we are planning to address potential activity impacts and risks.




*Santos Offshore: Western Australia Activity Map.*

Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is ALARP and acceptable over the life of the activity.

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

We have prepared consultation fact sheets which includes information about planned activities, identified environmental, social, economic and cultural aspects within the operational areas and EMBA and how we propose to manage impacts and risks.

## Contact us

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

If you consider you may be a relevant authority or other relevant interested persons or organisations, please contact us at the earliest opportunity to allow Santos to initiate consultation with you in relation to proposed activities and so you can tell us how you would like to be consulted throughout this process. Formal consultation closes on **22 August 2025**.

Santos is committed to undertaking genuine and meaningful consultation. We want to provide information for people to make informed assessments of the possible consequences of the proposed activity on them.

Your feedback and input are important to us and input will be considered in the development of our EPs.

Visit: **www.santos.com/offshoreconsultation**

Phone: **1800 267 600**

Email: **offshore.consultation@santos.com** for more information, to self-identify or to provide feedback.

# Sweet stories pay tribute

CAIN ANDREWS



Robin Miller-Dicks grew up around aviation.



Robin Miller-Dicks with her father Horrie Miller.

As WA battled a polio outbreak in the late 1960s, Robin Miller-Dicks took to the skies, flying solo across the North West to deliver thousands of vaccines to remote communities, helping eradicate the disease.

To disguise the bitter taste, she handed each child a sugar cube with the vaccine, earning her the name the Sugarbird Lady.

Now, nearly 50 years after her premature death, the plane she once flew is set to land in Broome on August 14.

Although the polio vaccine had been available for more than a decade in 1967, administering it in remote communities in the North West had become a major challenge for the WA Government.

Armed with her newly obtained commercial pilot's licence and a bold idea, 27-year-old Ms Miller-Dicks went to the Health Department with an extraordinary offer they couldn't refuse — she would fly her personal plane solo, administering the vaccine to remote communities.

Borrowing the money to buy a second-hand Cessna 182, Ms Miller-Dicks then spent the next two years flying around the Kimberley and Pilbara doing exactly as she promised — administering more than 37,000 doses of the life-saving drug entirely by herself.

"You keep long hours, eat any time, and land on some pretty rocky old strips, but I love the work," she told Australian Women's Weekly in September 1967. "I always wear slacks or a dress. If I appear in a white uniform and veil, the children get frightened and think I'm going to hurt them. It's hopeless, anyway, trying to keep a white uniform clean with all that red dust about."

After completing the immunisation program in 1969 and with more than 69,200 air kilometres of experience, Ms Miller-Dicks was offered a position with the Royal Flying Doctor Service.

But the Sugarbird Lady's story doesn't end there, with the pioneer servicing the region for years to come. One remarkable account of her daring endeavours involves Ms Miller-Dicks delivering a baby — once again single-handed — mid-air between the Great Sandy Desert and Marble Bar.

"We weren't in the air for more than a quarter of an hour when there was a shrill scream from the rear seat. I looked around and there was the baby's head already showing," she told Walkabout magazine in July 1972.

"I set the Baron on to automatic pilot, grabbed linen and plastic sheets, and a few other things, tilted back the rear seat, and prepared the frightened little girl for delivery."

Another time she flew a plane from Paris to Perth but was jailed in Saudi Arabia and put under armed guard for violating the country's air space.

"The main reason they gaoled us was that I was a woman pilot, something hitherto unheard of in their country. Highly suspicious, they thought. Also, my naked body didn't help, either," she told Walkabout of that madcap adventure.

According to Ms Miller-Dicks, her choice of attire, a mini-skirt, was the equivalent of wearing a birthday suit to the Saudis.

"Consequently, I was not even to be looked upon by their women, who really cover themselves."

After spending three nights locked up, the group she was with was given the all-clear to leave the country. But she was then told the Emir wanted her for his personal harem. "Tell him to go to hell," she was reported to say by Walkabout.

Luckily, it was just a distasteful April Fool's joke and Ms Miller-Dicks was allowed to leave and return to Perth.

In 1971 she published her autobiography, Flying Nurse, detailing her trailblazing career up to that point.

In 1973 she finished sixth in the famous transcontinental Powder Puff Derby women's air race in the United States, after marrying Harold Dicks, who she had worked at the RFDS earlier that year.

She also won numerous awards and accolades throughout her life, receiving the Nancy Bird (Walton) award as Australia's woman pilot of the year in 1970 and a diploma of merit by the Associazione Nazionale Infermieri in Italy in 1969.

SEEKING RELEVANT PERSONS

## Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

Santos

**Santos is seeking to consult with relevant persons whose functions, interests or activities may be affected by proposed activities offshore north-west of Western Australia in Commonwealth waters that will be managed under the: Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. The environment plan (EP) is required to support regional exploration and appraisal activities to identify hydrocarbon resources additional to Santos' known discoveries in the region.**

The EP allows for the drilling of up to seven wells in four Operational Areas (OAs) with the closest located approximately 123 km north of Port Hedland.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

The Environment Plan (EP) being prepared for the proposed activities, once accepted, is valid for five years, and will allow for the drilling of up to seven exploration/appraisal wells across four Operational Areas (OAs).

### The environment that may be affected (EMBA) by proposed activities

Santos is assessing impacts and risks of the proposed activities on ecosystems (including people and communities), natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places with the Environment that may be affected (EMBA). This will include assessment of the social, economic and cultural features of the environment.

The map below depicts Operational Areas for proposed activities and the EMBA. The EMBA represents the greatest spatial extent that could be affected by unplanned 'worst case' spill scenarios, before any measures to reduce risk are considered.

Santos is proposing to implement measures to reduce the impacts and risks of the activities. It is a requirement under relevant environmental legislation that these impacts and risks are reduced to as low as reasonably practicable (ALARP) and to an acceptable level.

### Seeking Relevant Persons for Environment Plans

All petroleum activities in Commonwealth waters must have an EP accepted by NOPSEMA before they can take place.

Under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth), Santos is required to consult with relevant persons and organisations who have functions, interests or activities that may be affected by the proposed activities. Function, interests or activities include those arising in relation to spiritual or cultural connections to land and sea country in accordance with Indigenous tradition; tourism; recreational and commercial fishing; other commercial or recreational activities and local communities that might be affected by our proposed activity (these are examples and not an exhaustive list).

Your input is important to Santos:

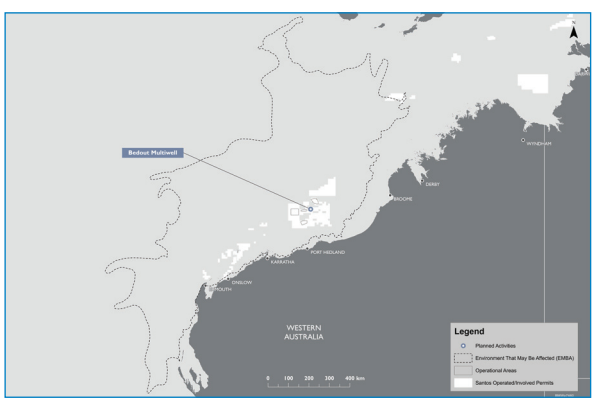
- so that we can understand the environmental values in the OAs and the EMBA, the environmental impacts and risks associated with the activities;
- to inform how consultation processes may need to be adapted for different relevant persons;
- to ensure that we provide information to people in an appropriate and accessible manner; and
- to assist with Santos' preparation of the EP.

More information on the proposed activities is available on our website **santos.com/offshoreconsultation/bedout**

### We welcome your input

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

This feedback helps us to refine or change the management measures we are planning to address potential activity impacts and risks.




*Santos Offshore: Western Australia Activity Map.*

Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is ALARP and acceptable over the life of the activity.

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

We have prepared consultation fact sheets which includes information about planned activities, identified environmental, social, economic and cultural aspects within the operational areas and EMBA and how we propose to manage impacts and risks.

### Contact us

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

If you consider you may be a relevant authority or other relevant interested persons or organisations, please contact us at the earliest opportunity to allow Santos to initiate consultation with you in relation to proposed activities and so you can tell us how you would like to be consulted throughout this process. Formal consultation closes on **22 August 2025**.

Santos is committed to undertaking genuine and meaningful consultation. We want to provide information for people to make informed assessments of the possible consequences of the proposed activity on them.

Your feedback and input are important to us and input will be considered in the development of our EPs.

Visit: **www.santos.com/offshoreconsultation**

Phone: **1800 267 600**

Email: **offshore.consultation@santos.com** for more information, to self-identify or to provide feedback.

# Farmers cheer hay run relief






**Residents cheer in the convoy at the SA/WA quarantine checkpoint on the Nullarbor.** Picture: Farmers Across Borders/The Wandering Stone

**MELISSA PEDELTY & MARK SMITH**

WA's historic hay run has successfully delivered nearly 6000 bales of hay to drought-affected farming families across South Australia.

The 86-truck mercy dash broke records when it left Fraser Range Station on the Nullarbor on Friday, bringing practical support and hope to farmers battling ongoing dry conditions.

The grassroots effort driven by Farmers Across Borders and Need for Feed was both organisations' biggest interstate convoy to date.

More than 400 farming families — and roughly 450,000 livestock — benefited from the delivery which arrived on Sunday, aimed at easing financial pressure and protecting the wellbeing of livestock and farmers.

Since it was established in 2019, Farmers Across Borders has delivered 15,000 donated bales of hay across New South Wales, Queensland and WA to those in need — making this run of 6000 bales a mammoth effort for the volunteer-run organisation.

The South Australian hay run was more than double the size of Farmers Across Borders' Australia Day hay run record in 2020, when 20 trucks delivered 2000 tonnes of feed to 60 stations across Gascoyne and Murchison. Farmers Across Borders president Sam Starcevich, who farms at Salmon Gums, said the convoy was a powerful reminder of what happened when people came together for the right reasons.

"We've had an incredible team of volunteers, generous donors, and essential support from both States," she said.

"We're proud to stand beside South Australian farmers in their time of need."

Truckies and their support crews travelled more than 1300km to reach the assembly point in Wudinna on July 26 before splitting off to various drop-off locations within the State. Four waves of road trains made the trek at 30-minute intervals, leaving Fraser Range around midday on July 25 after a delay due to freak weather, including 100km/h winds.

If the convoy was to line up back-to-back, it would cover 5km of road.

There were tears and cheers as the convoy rolled into the quarantine checkpoint at the border, after witnessing the welcoming committee of locals on arrival.

Farms across the State have been in the grip of devastating drought, with many areas having recorded record-low rainfall over the past 12 months.

SEEKING RELEVANT PERSONS

## Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

Santos

**Santos is seeking to consult with relevant persons whose functions, interests or activities may be affected by proposed activities offshore north-west of Western Australia in Commonwealth waters that will be managed under the: Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. The environment plan (EP) is required to support regional exploration and appraisal activities to identify hydrocarbon resources additional to Santos' known discoveries in the region.**

The EP allows for the drilling of up to seven wells in four Operational Areas (OAs) with the closest located approximately 123 km north of Port Hedland.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

The Environment Plan (EP) being prepared for the proposed activities, once accepted, is valid for five years, and will allow for the drilling of up to seven exploration/appraisal wells across four Operational Areas (OAs).

### The environment that may be affected (EMBA) by proposed activities

Santos is assessing impacts and risks of the proposed activities on ecosystems (including people and communities), natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places with the Environment that may be affected (EMBA). This will include assessment of the social, economic and cultural features of the environment.

The map below depicts Operational Areas for proposed activities and the EMBA. The EMBA represents the greatest spatial extent that could be affected by unplanned 'worst case' spill scenarios, before any measures to reduce risk are considered.

Santos is proposing to implement measures to reduce the impacts and risks of the activities. It is a requirement under relevant environmental legislation that these impacts and risks are reduced to as low as reasonably practicable (ALARP) and to an acceptable level.

### Seeking Relevant Persons for Environment Plans

All petroleum activities in Commonwealth waters must have an EP accepted by NOPSEMA before they can take place.

Under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth), Santos is required to consult with relevant persons and organisations who have functions, interests or activities that may be affected by the proposed activities. Function, interests or activities include those arising in relation to spiritual or cultural connections to land and sea country in accordance with Indigenous tradition; tourism; recreational and commercial fishing; other commercial or recreational activities and local communities that might be affected by our proposed activity (these are examples and not an exhaustive list).

Your input is important to Santos:

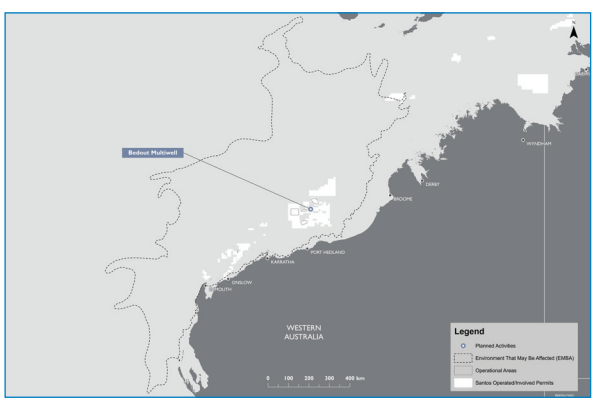
- so that we can understand the environmental values in the OAs and the EMBA, the environmental impacts and risks associated with the activities;
- to inform how consultation processes may need to be adapted for different relevant persons;
- to ensure that we provide information to people in an appropriate and accessible manner; and
- to assist with Santos' preparation of the EP.

More information on the proposed activities is available on our website **santos.com/offshoreconsultation/bedout**

### We welcome your input

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

This feedback helps us to refine or change the management measures we are planning to address potential activity impacts and risks.




*Santos Offshore: Western Australia Activity Map.*

Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is ALARP and acceptable over the life of the activity.

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

We have prepared consultation fact sheets which includes information about planned activities, identified environmental, social, economic and cultural aspects within the operational areas and EMBA and how we propose to manage impacts and risks.

### Contact us

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

If you consider you may be a relevant authority or other relevant interested persons or organisations, please contact us at the earliest opportunity to allow Santos to initiate consultation with you in relation to proposed activities and so you can tell us how you would like to be consulted throughout this process. Formal consultation closes on **22 August 2025**.

Santos is committed to undertaking genuine and meaningful consultation. We want to provide information for people to make informed assessments of the possible consequences of the proposed activity on them.

Your feedback and input are important to us and input will be considered in the development of our EPs.

Visit: **www.santos.com/offshoreconsultation**
Phone: **1800 267 600**
Email: **offshore.consultation@santos.com**
for more information, to self-identify or to provide feedback.

# Critical eye-care in the frame

MADELIN HAYES

A new eyewear collection launched by Specsavers in collaboration with Martu artist Corban Clause Williams is helping to fund critical eye-care for Indigenous people.

Williams, a young artist from the Parnngurr community in the Pilbara, has designed four frames featuring vibrant artworks inspired by the stories passed down from his grandparents.

Each pair sold will contribute $25 to The Fred Hollows Foundation Indigenous Australia Program, which supports access to culturally appropriate eye care services to remote and underserved Aboriginal and Torres Strait Islander communities.

In his artwork Kaalpa, Williams presents an aerial interpretation of his grandfather's country.

Williams said he drew inspiration from the traditional desert-dwelling days, while also contributing his own artistic voice.

"My favourite memories with my family are the times we spent together out in the swamp area between Newman and Kumarina," he said. "Nan, Pop, Mum and Dad would tell funny stories about our family and make me laugh, I'd help them make a fire and tea and we would hunt for bush tucker. I come to Martumili to paint about my country, where my grandfather walked around and collected food, and visited the same rock holes I do. I paint to keep my culture and stories and share with others."



**Martu artist Corban Clause Williams has collaborated with Specsavers on a eyewear collection.** Picture: Specsavers

SEEKING RELEVANT PERSONS

## Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

Santos

**Santos is seeking to consult with relevant persons whose functions, interests or activities may be affected by proposed activities offshore north-west of Western Australia in Commonwealth waters that will be managed under the: Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. The environment plan (EP) is required to support regional exploration and appraisal activities to identify hydrocarbon resources additional to Santos' known discoveries in the region.**

The EP allows for the drilling of up to seven wells in four Operational Areas (OAs) with the closest located approximately 123 km north of Port Hedland.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

The Environment Plan (EP) being prepared for the proposed activities, once accepted, is valid for five years, and will allow for the drilling of up to seven exploration/appraisal wells across four Operational Areas (OAs).

### The environment that may be affected (EMBA) by proposed activities

Santos is assessing impacts and risks of the proposed activities on ecosystems (including people and communities), natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places with the Environment that may be affected (EMBA). This will include assessment of the social, economic and cultural features of the environment.

The map below depicts Operational Areas for proposed activities and the EMBA. The EMBA represents the greatest spatial extent that could be affected by unplanned 'worst case' spill scenarios, before any measures to reduce risk are considered.

Santos is proposing to implement measures to reduce the impacts and risks of the activities. It is a requirement under relevant environmental legislation that these impacts and risks are reduced to as low as reasonably practicable (ALARP) and to an acceptable level.

### Seeking Relevant Persons for Environment Plans

All petroleum activities in Commonwealth waters must have an EP accepted by NOPSEMA before they can take place.

Under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth), Santos is required to consult with relevant persons and organisations who have functions, interests or activities that may be affected by the proposed activities. Function, interests or activities include those arising in relation to spiritual or cultural connections to land and sea country in accordance with Indigenous tradition; tourism; recreational and commercial fishing; other commercial or recreational activities and local communities that might be affected by our proposed activity (these are examples and not an exhaustive list).

Your input is important to Santos:

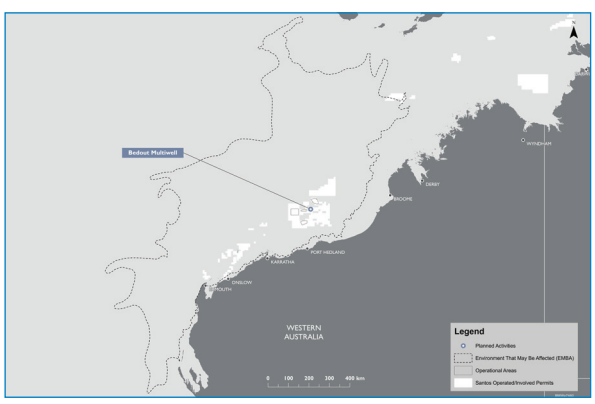
- so that we can understand the environmental values in the OAs and the EMBA, the environmental impacts and risks associated with the activities;
- to inform how consultation processes may need to be adapted for different relevant persons;
- to ensure that we provide information to people in an appropriate and accessible manner; and
- to assist with Santos' preparation of the EP.

More information on the proposed activities is available on our website **santos.com/offshoreconsultation/bedout**

### We welcome your input

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

This feedback helps us to refine or change the management measures we are planning to address potential activity impacts and risks.




*Santos Offshore: Western Australia Activity Map.*

Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is ALARP and acceptable over the life of the activity.

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

We have prepared consultation fact sheets which includes information about planned activities, identified environmental, social, economic and cultural aspects within the operational areas and EMBA and how we propose to manage impacts and risks.

### Contact us

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

If you consider you may be a relevant authority or other relevant interested persons or organisations, please contact us at the earliest opportunity to allow Santos to initiate consultation with you in relation to proposed activities and so you can tell us how you would like to be consulted throughout this process. Formal consultation closes on **22 August 2025**.

Santos is committed to undertaking genuine and meaningful consultation. We want to provide information for people to make informed assessments of the possible consequences of the proposed activity on them.

Your feedback and input are important to us and input will be considered in the development of our EPs.

Visit: **www.santos.com/offshoreconsultation**
Phone: **1800 267 600**
Email: **offshore.consultation@santos.com**
for more information, to self-identify or to provide feedback.

# Powering up initiatives

MADELIN HAYES

Community groups across regional Western Australia are encouraged to apply for the latest round of Horizon Power's Community Partnerships grant program, which supports local initiatives that enrich regional communities.

Each financial year, the program provides $1.1 million to initiatives that support vibrancy in remote communities within areas Horizon Power operates: the Pilbara, Kimberley, Gascoyne, Mid West, Esperance and Goldfields regions.

Organisations can apply for funding between $1000 and $10,000, while initiatives that operate across multiple regions or involve large-scale events may be eligible for grants of up to $50,000.

Past recipients of the program are regional sporting associations, music and cultural festivals, community arts programs and education initiatives.

Thanks to a recent round of funding, Anglicare WA was able to open a permanent wardrobe service in Karratha.

The service provides new clothing to people facing financial hardship, offering them the opportunity to choose garments that suit their style and needs, helping to restore dignity and confidence during difficult times.

"The housing crisis and cost-of-living continues to affect people right across the State but we know these issues are exacerbated in WA's regions, particularly in the Pilbara and Kimberley," Anglicare WA chief executive Mark Glasson said.



Horizon Power community engagement manager Juliane Bush and Anglicare WA corporate relations manager Jacqueline Chambers at the opening of Karratha Thread Together, funded with a community grant.

"People in need deserve the dignity and choice of new clothing, without judgment."

Horizon Power acting chief executive Krystal Skinner said the program was focused on initiatives in the regions that "have a strong community impact and are accessible to many".

"I really encourage organisations that are making a difference in their community to apply. All applications are carefully considered, ensuring that every initiative or organisation we partner with has a meaningful impact on the communities we serve."

Applications for the latest round of partnerships close on August 22. Successful recipients will be announced in October.

To find out more about the the community partnership grants, visit horizonpower.com.au.

# $150k grant boosts Call to Action at bush meet

MADELIN HAYES

More than 500 people attended this year's on-Country Yule River Bush Meeting to discuss issues including the National Agreement on Closing the Gap and set local priorities for the year with industry and government representatives.

Minister for Aboriginal Affairs Don Punch also announced a $150,000 annual State Government funding commitment for two years to support the 2024 Yule River Call to Action and Solutions Roadmap.

The meeting was co-ordinated by the Yamatji Marlpa Aboriginal Corporation.

"I stand here proudly to acknowledge the old people who met here at the Yule River Meeting Place decades ago to organise the 1946 Pilbara Strike," YMAC co-chair Doris Eaton said as she opened the meeting.

"They fought for us. From Onslow to Marble Bar, from Roebourne, from the desert to Hedland — they stood as one. We're here to challenge the government. We're here as one voice."

Earlier this year, YMAC urged the State Government to respond to the concerns in the CTA following a report by the Productivity Commission that showed little progress on Closing the Gap.

SEEKING RELEVANT PERSONS

## Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

Santos

**Santos is seeking to consult with relevant persons whose functions, interests or activities may be affected by proposed activities offshore north-west of Western Australia in Commonwealth waters that will be managed under the: Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. The environment plan (EP) is required to support regional exploration and appraisal activities to identify hydrocarbon resources additional to Santos' known discoveries in the region.**

The EP allows for the drilling of up to seven wells in four Operational Areas (OAs) with the closest located approximately 123 km north of Port Hedland.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

The Environment Plan (EP) being prepared for the proposed activities, once accepted, is valid for five years, and will allow for the drilling of up to seven exploration/appraisal wells across four Operational Areas (OAs).

### The environment that may be affected (EMBA) by proposed activities

Santos is assessing impacts and risks of the proposed activities on ecosystems (including people and communities), natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places with the Environment that may be affected (EMBA). This will include assessment of the social, economic and cultural features of the environment.

The map below depicts Operational Areas for proposed activities and the EMBA. The EMBA represents the greatest spatial extent that could be affected by unplanned 'worst case' spill scenarios, before any measures to reduce risk are considered.

Santos is proposing to implement measures to reduce the impacts and risks of the activities. It is a requirement under relevant environmental legislation that these impacts and risks are reduced to as low as reasonably practicable (ALARP) and to an acceptable level.

### Seeking Relevant Persons for Environment Plans

All petroleum activities in Commonwealth waters must have an EP accepted by NOPSEMA before they can take place.

Under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth), Santos is required to consult with relevant persons and organisations who have functions, interests or activities that may be affected by the proposed activities. Function, interests or activities include those arising in relation to spiritual or cultural connections to land and sea country in accordance with Indigenous tradition; tourism; recreational and commercial fishing; other commercial or recreational activities and local communities that might be affected by our proposed activity (these are examples and not an exhaustive list).

Your input is important to Santos:

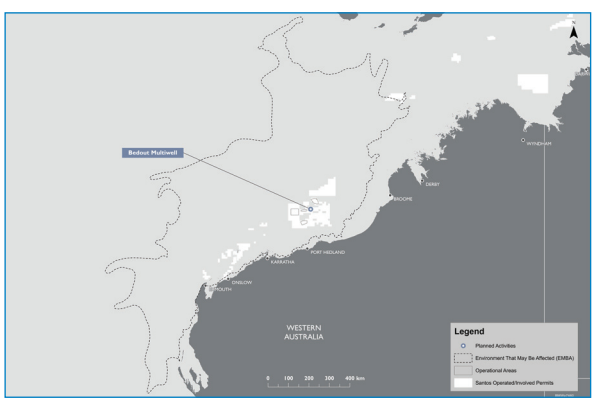
- so that we can understand the environmental values in the OAs and the EMBA, the environmental impacts and risks associated with the activities;
- to inform how consultation processes may need to be adapted for different relevant persons;
- to ensure that we provide information to people in an appropriate and accessible manner; and
- to assist with Santos' preparation of the EP.

More information on the proposed activities is available on our website **santos.com/offshoreconsultation/bedout**

### We welcome your input

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

This feedback helps us to refine or change the management measures we are planning to address potential activity impacts and risks.




*Santos Offshore: Western Australia Activity Map.*

Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is ALARP and acceptable over the life of the activity.

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

We have prepared consultation fact sheets which includes information about planned activities, identified environmental, social, economic and cultural aspects within the operational areas and EMBA and how we propose to manage impacts and risks.

### Contact us

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

If you consider you may be a relevant authority or other relevant interested persons or organisations, please contact us at the earliest opportunity to allow Santos to initiate consultation with you in relation to proposed activities and so you can tell us how you would like to be consulted throughout this process. Formal consultation closes on **22 August 2025**.

Santos is committed to undertaking genuine and meaningful consultation. We want to provide information for people to make informed assessments of the possible consequences of the proposed activity on them.

Your feedback and input are important to us and input will be considered in the development of our EPs.

Visit: **www.santos.com/offshoreconsultation**
Phone: **1800 267 600**
Email: **offshore.consultation@santos.com**
for more information, to self-identify or to provide feedback.

# Resident almost shot lying in bed

A 53-year-old man is on the run after a botched late night shooting, which left a woman "shaken" after the bullet missed her foot by centimetres.

Officers were called after reports of a shooting at a home on Willoughby Retreat in Clarkson about 10pm on Tuesday.

Police want to speak with Jason James Cockie about the shooting.

The homeowner, who asked to stay anonymous, said she was in bed when the shot was fired.

"I was in bed when I heard screaming and swearing," she said. "I didn't get hurt; the bullet came through the shutter, the window, the flyscreen and I was . . . in the room in bed.

"It was maybe 30cm from me when I put my foot on the ground."

The woman said she froze in shock before calling triple-0.

Police raided a neighbouring property and seized drugs, cash, firearms and ammunition.

Joondalup Det-Sen. Const. Damian Webb said officers believed the shot was meant for the neighbouring home.

Two people have been arrested. A third person — a 29-year-old man — has been charged with drug, firearm and weapons offences and will face court on Thursday.



Picture: Riley Churchman

# Coach pleads guilty to child abuse

**SARAH CRAWFORD**

The former head coach of the Australian women's indoor hockey team has pleaded guilty to kissing an underage girl.

Lauren Nicole Austin pleaded guilty in Perth Magistrates Court on Wednesday to four counts of indecently dealing with a child.

Two further charges of sexual penetration without consent were withdrawn by the prosecution.

WA Police's sex assault squad charged Austin — who has represented Australia as a hockey player and coach — in 2024 with a number of sexual offences, including child abuse-related crimes.

On Wednesday the 39-year-old answered, "Guilty, your honour", when asked what she pleaded to each charge.

The court was told the offences included kissing the teenage girl on different dates in March 2024 in Yanchep, Sorrento and Fremantle.

Austin has now been committed for sentence in the District Court.

She is due to appear next month.

Hockey Australia said previously in a statement that it fully co-operated with authorities and had taken steps to mitigate any risk to participants.

"To protect the integrity of the process and the interests of all parties, no further information will be provided at this time," it said.

A Hockey Australia spokesperson said Austin was prohibited from involvement in hockey in any capacity at any level in the country while she was before the courts.

According to Hockey Australia, Austin represented the country in the indoor hockey squad for several years from 2006 until her retirement in 2020, including at two Indoor Hockey World Cups in 2007 and 2018.

Announcing her retirement, she said the impact of COVID-19 on travelling to Victoria to visit her family had formed part of her decision.

SEEKING RELEVANT PERSONS

## Bedout Multi-well Exploration and Appraisal Drilling Environment Plan

Santos

**Santos is seeking to consult with relevant persons whose functions, interests or activities may be affected by proposed activities offshore north-west of Western Australia in Commonwealth waters that will be managed under the: Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. The environment plan (EP) is required to support regional exploration and appraisal activities to identify hydrocarbon resources additional to Santos' known discoveries in the region.**

The EP allows for the drilling of up to seven wells in four Operational Areas (OAs) with the closest located approximately 123 km north of Port Hedland.

The proposed activities are planned to commence as early as Q2 2026, subject to obtaining all regulatory and business approvals. All wells drilled will be permanently plugged and abandoned.

The Environment Plan (EP) being prepared for the proposed activities, once accepted, is valid for five years, and will allow for the drilling of up to seven exploration/appraisal wells across four Operational Areas (OAs).

### The environment that may be affected (EMBA) by proposed activities

Santos is assessing impacts and risks of the proposed activities on ecosystems (including people and communities), natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places with the Environment that may be affected (EMBA). This will include assessment of the social, economic and cultural features of the environment.

The map below depicts Operational Areas for proposed activities and the EMBA. The EMBA represents the greatest spatial extent that could be affected by unplanned 'worst case' spill scenarios, before any measures to reduce risk are considered.

Santos is proposing to implement measures to reduce the impacts and risks of the activities. It is a requirement under relevant environmental legislation that these impacts and risks are reduced to as low as reasonably practicable (ALARP) and to an acceptable level.

### Seeking Relevant Persons for Environment Plans

All petroleum activities in Commonwealth waters must have an EP accepted by NOPSEMA before they can take place.

Under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (Cth), Santos is required to consult with relevant persons and organisations who have functions, interests or activities that may be affected by the proposed activities. Function, interests or activities include those arising in relation to spiritual or cultural connections to land and sea country in accordance with Indigenous tradition; tourism; recreational and commercial fishing; other commercial or recreational activities and local communities that might be affected by our proposed activity (these are examples and not an exhaustive list).

Your input is important to Santos:

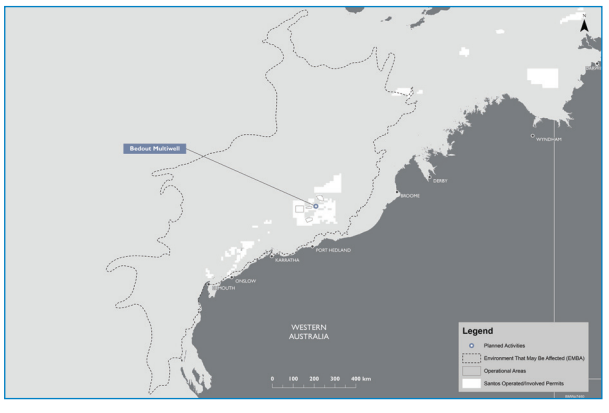
- so that we can understand the environmental values in the OAs and the EMBA, the environmental impacts and risks associated with the activities;
- to inform how consultation processes may need to be adapted for different relevant persons;
- to ensure that we provide information to people in an appropriate and accessible manner; and
- to assist with Santos' preparation of the EP.

More information on the proposed activities is available on our website **santos.com/offshoreconsultation/bedout**

### We welcome your input

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

This feedback helps us to refine or change the management measures we are planning to address potential activity impacts and risks.




*Santos Offshore: Western Australia Activity Map.*

Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is ALARP and acceptable over the life of the activity.

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

We have prepared consultation fact sheets which includes information about planned activities, identified environmental, social, economic and cultural aspects within the operational areas and EMBA and how we propose to manage impacts and risks.

### Contact us

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

If you consider you may be a relevant authority or other relevant interested persons or organisations, please contact us at the earliest opportunity to allow Santos to initiate consultation with you in relation to proposed activities and so you can tell us how you would like to be consulted throughout this process. Formal consultation closes on **22 August 2025**.

Santos is committed to undertaking genuine and meaningful consultation. We want to provide information for people to make informed assessments of the possible consequences of the proposed activity on them.

Your feedback and input are important to us and input will be considered in the development of our EPs.

Visit: **www.santos.com/offshoreconsultation**
Phone: **1800 267 600**
Email: **offshore.consultation@santos.com**
for more information, to self-identify or to provide feedback.

# Santos

**Santos is seeking to identify and consult with authorities, persons and organisations whose functions, interests or activities may be affected by Bedout exploration drilling activities approximately 123 km north of Port Hedland, Western Australia.**

**Please contact Santos now if these activities affect you and you would like to be consulted.**

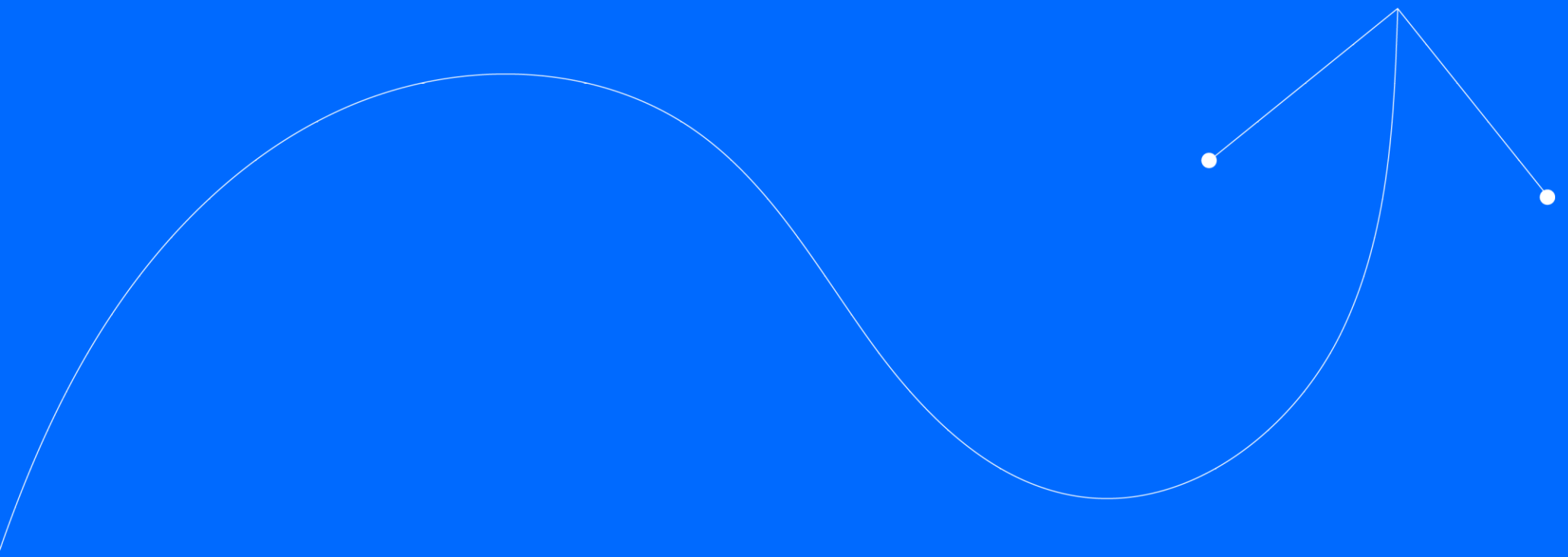
**Consultation closes on 22 August 2025.**

# Presentation

Santos

# BEDOUT MULTI-WELL EXPLORATION AND APPRAISAL DRILLING ENVIRONMENT PLAN

**Commonwealth**



July 2025

# Acknowledgement of Country

“Santos acknowledges the traditional owners of the lands on which we meet on today and we pay our respects to Elders past and present.”

# Welcome and Introductions

We are here today to share information about our company, seek information from you and listen to your questions about Santos' upcoming activities.



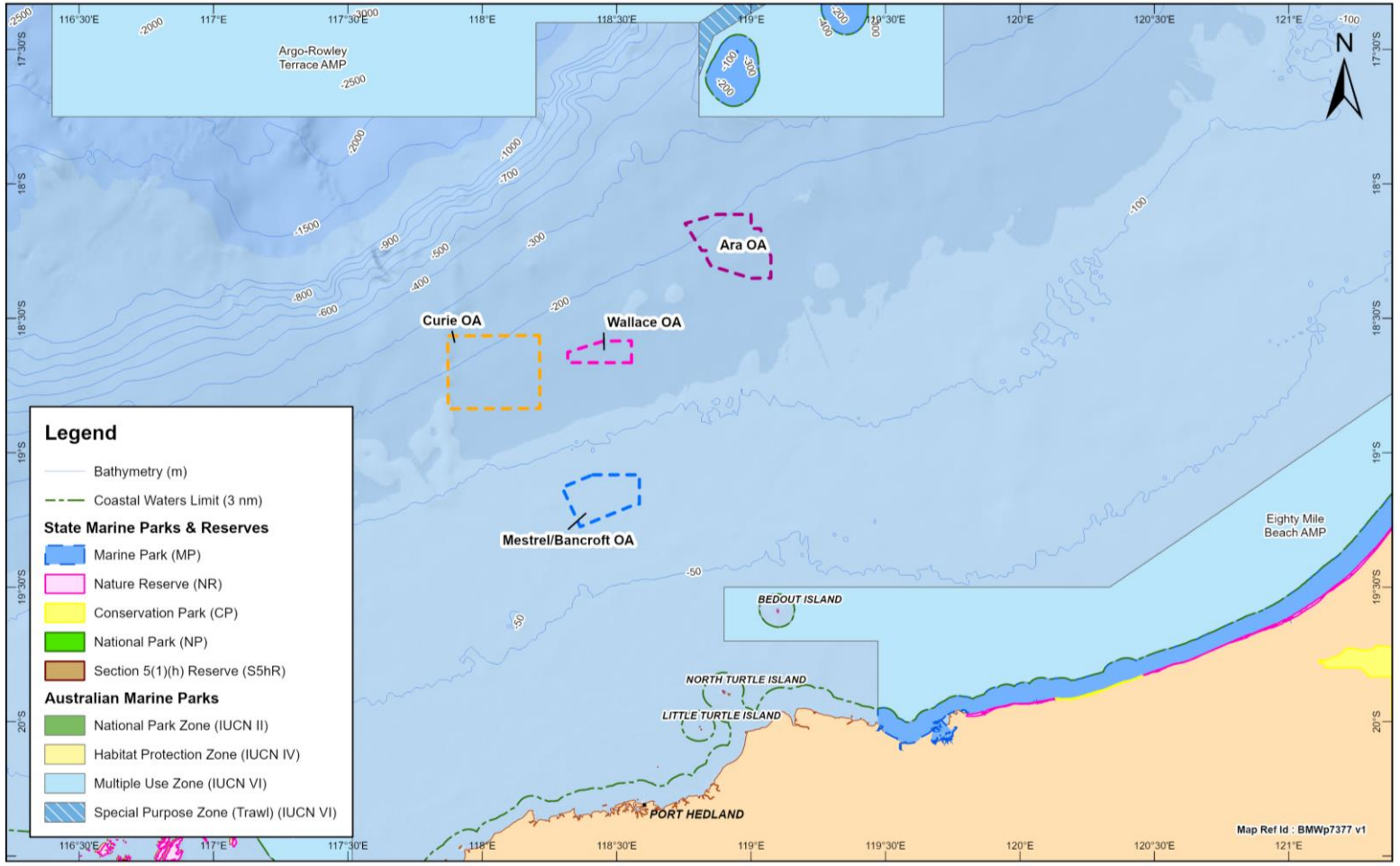
# Santos' geographical footprint




- Operating decarbonisation hub
- Planned decarbonisation hub
- Development projects
- Operated facilities
- Non-operated facilities
- Unsanctioned projects – subject to regulatory approvals and/or FID
- Santos office locations

# Why we are here today

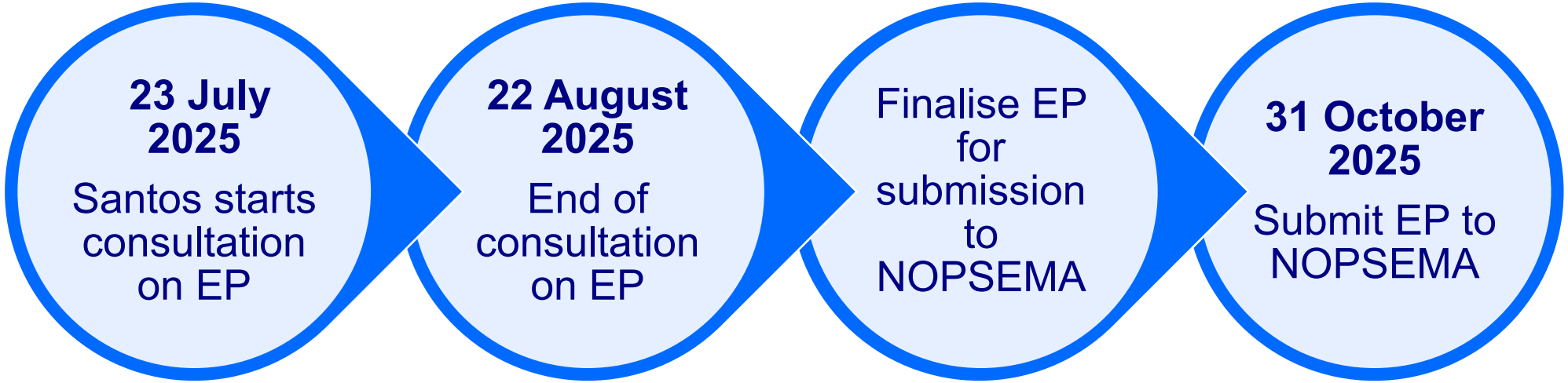
- Bedout exploration and appraisal drilling program
- Purpose is to find a new offshore gas supply
- Environment Plan (acceptance) will allow for up to seven wells over a 5-year period
- Four operational areas, with two wells planned in 2026, starting from ~July 2026
- Nearest operating area is approx. 123km north of Port Hedland




For more details, please refer to **Consultation Information Sheet - Bedout Multi-well Exploration and Appraisal Drilling Program Fact Sheet**

# How your information will be used

**Please let us know if anything you have told us is sensitive, and we will ensure it is not published***




- We use information from consultation to help us:
  - Better understand the environment (e.g. cultural features) we are operating in where information is not publicly available
  - Minimise impacts and risks to the environment
- A summary of information received during consultation will in included the Environment Plan (EP)
- Following acceptance, the EP will be published online

For more details, please refer to **Consultation Information Sheet - Bedout Multi-well Exploration and Appraisal Drilling Program Fact Sheet**

# Activities for this Environment Plan

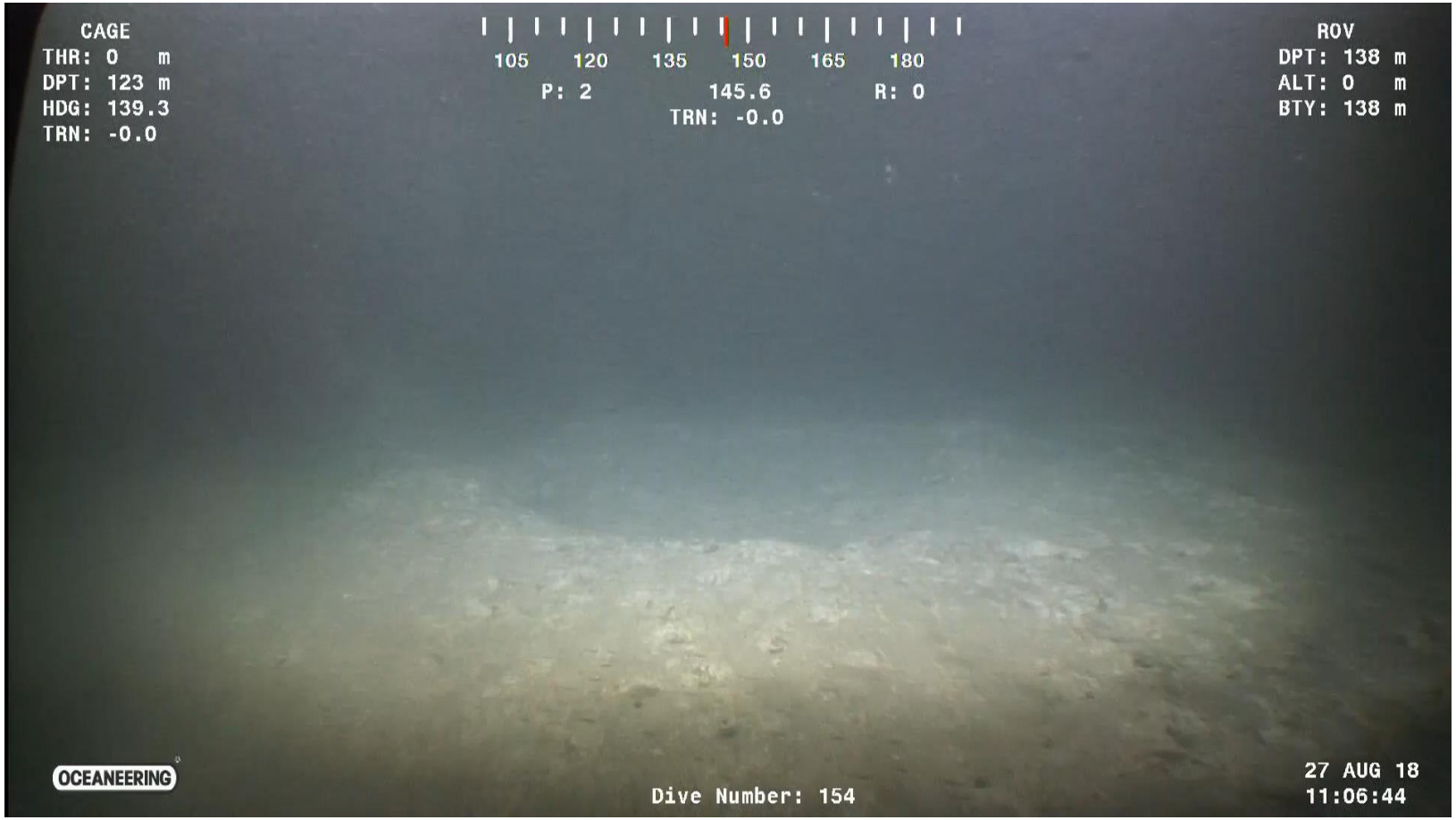
- Up to seven exploration and/or appraisal wells – jack-up rig for shallower water and semi-submersible rig for deeper waters
- Geophysical and geotechnical surveys prior to drilling using an autonomous underwater vehicle
- Each well is expected to take ~40 - 110 days per well
- After assessing, Santos will install cement plugs and make the wells safe (plug and abandon). No equipment to be left at the drilling locations.
- Helicopters for crew changes, critical equipment supply and emergency response
- Support vessels in the field





# About the environment

- “Environment” refers to ecological, socio-economic and cultural features
- Ecological environment is where living things (e.g. plants and animals) interact with their non-living surroundings (e.g. air, water, soil)
- Seabed within the Operational Areas is generally flat and featureless, mainly sand with some silt and clay




For more details, please refer to **Consultation Information Sheet - Bedout Multi-well Exploration and Appraisal Drilling Program Fact Sheet**

# Activity impacts and risks

## Impacts

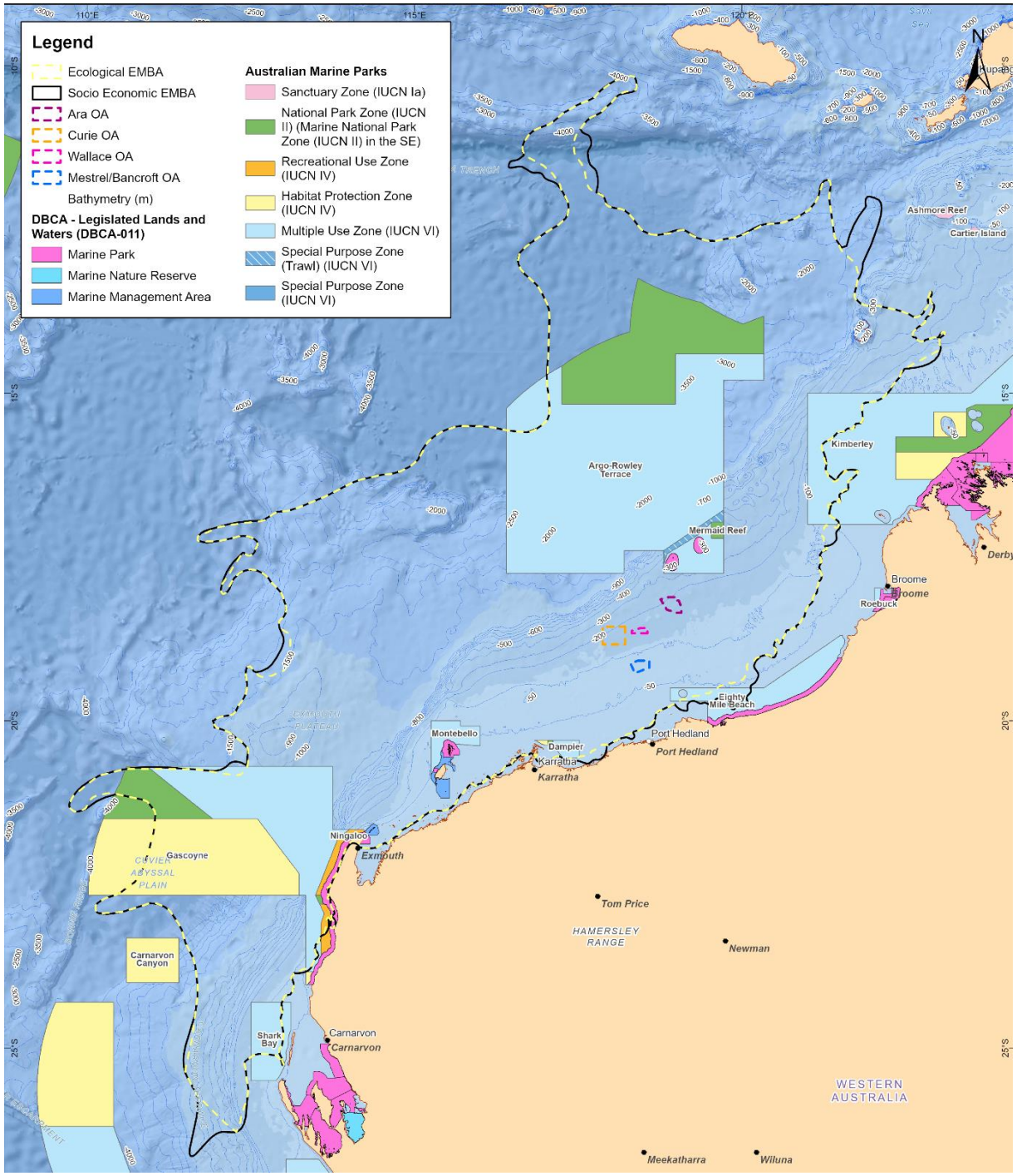
- Activity impacts typically occur within Operational Areas

## Risks

- The widest geographic extent of activity risk is defined by potential impacts resulting from hundreds of computer modelled credible worst case spill scenarios

## Environment that May Be Affected (EMBA) Details

- A spill cannot affect all areas of the EMBA at the same time




For more details, please refer to **Consultation Information Sheet - Bedout Multi-well Exploration and Appraisal Drilling EP Fact Sheet**

Santos

# How will this impact environment?

| Potential Impacts (operational areas) |
| --- |
| • Noise emissions |
| • Light emissions |
| • Physical presence and interaction with other marine users |
| • Seabed and above seabed level habitat disturbance |
| • Operational discharges from vessels |
| • Operational discharges from drilling |
| • Atmospheric emissions |

| Unplanned Events / Risks (EMBA) |
| --- |
| • Unplanned introduction of invasive marine species |
| • Unplanned introduction of non-indigenous flora and fauna |
| • Unplanned interaction with marine fauna |
| • Unplanned release of solid objects |
| • Unplanned hazardous liquid release to the marine environment (non-hydrocarbon) |
| • Unplanned minor hydrocarbon release |
| • Unplanned marine diesel oil release |
| • Unplanned hydrocarbon release from loss of well control during drilling |

For more details, please refer to **Consultation Information Sheet - Bedout Multi-well Exploration and Appraisal Drilling EP Fact Sheet**

Santos

# An example of how we manage impacts

**Unplanned hydrocarbon release from loss of well control during drilling**

- The likelihood of a loss of well control event leading to a spill is considered ‘remote’
- Reduction of a hydrocarbon spill risk to ‘low level’ is supported by the combination of safe drilling methods and spill response strategies, such as the Oil Pollution Emergency Plan

**Potential Impacts:**

- Reduction in water quality
- Potential temporary disruption to fishing activities
- Total or partial mortality of marine flora and early life stages of resident fish and invertebrate species

**Key Management Measures:**

- 500m exclusion zone around drilling activities
- MODU and support vessel spill response plans
- Documented maintenance program in place for equipment on MODU that provides a status on maintenance of equipment
- Source control emergency response plans in place for all drilling activities, such as but not limited to:
  - Relief Well Drilling
  - Activation of blow-out preventer stack

For more details, please refer to **Consultation Information Sheet - Bedout Multi-well Exploration and Appraisal Drilling Program Fact Sheet**

# Oil Spill Response

Under National Plan arrangements:

- **Santos** is the Control Agency in Commonwealth Waters for spills originating from its petroleum activities, with responsibility for initiating and managing an effective response.
- The **Australian Maritime Safety Authority** (AMSA) is the Control Agency for ship-based spills in Commonwealth Waters.
- The WA **Department of Transport (DoT)** is the Control Agency in State Waters.

***"Culture and heritage management is the incorporation of local and traditional knowledge to limit the impact of oil and resultant response activities on cultural and heritage values or resources."***

***"Culture and heritage management may take place as part of marine response or shoreline response and relies on the incorporation of local knowledge and local concerns."***

***"The effectiveness of culture and heritage management can be severely limited however by not engaging with the correct stakeholders and failing to incorporate or understand specific cultural or heritage needs or concerns."***

***Department of Transport, Incident Management Plan, September 2023***

# Oil Spill Prevention and Preparedness

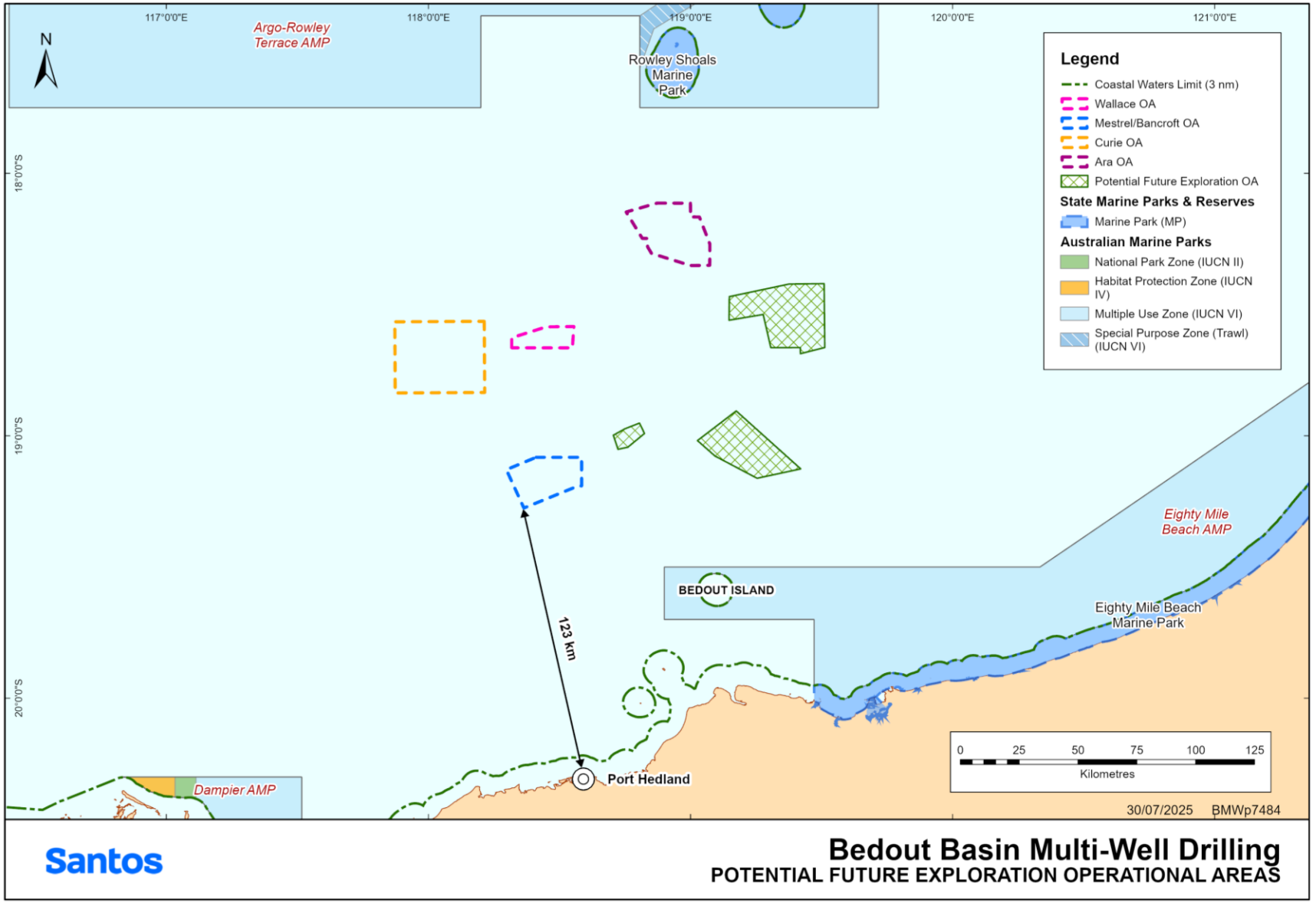
- Santos is required to prepare an Oil Pollution Emergency Plan (OPEP) for each activity, which forms part of the EP and is assessed by the NOPSEMA in Commonwealth waters and DEMIRS in WA State waters.
- The OPEP sets out the process to manage a spill.
- The OPEP identifies and prioritises spill response strategies for all potential spill events and describes how Santos prepares to respond in the remote event of a spill.





**Above photos:** Annual offshore field deployment exercise done in April 2024 near Varanus Island with the Santos Current Buster (on water oil containment and recovery system)

# Upcoming Consultation in Bedout Basin




- Santos will soon be working on a second drilling EP with additional OAs in the Bedout Basin
- Activities, impacts and risks are similar to those discussed today
- Any initial feedback on these additional OAs is welcome during this consultation
- Further details and information will be provided in due course



**Santos aims to make meaningful, positive, long-term contributions to the economy and the areas and communities where we operate.**

# Community Relations and Investment

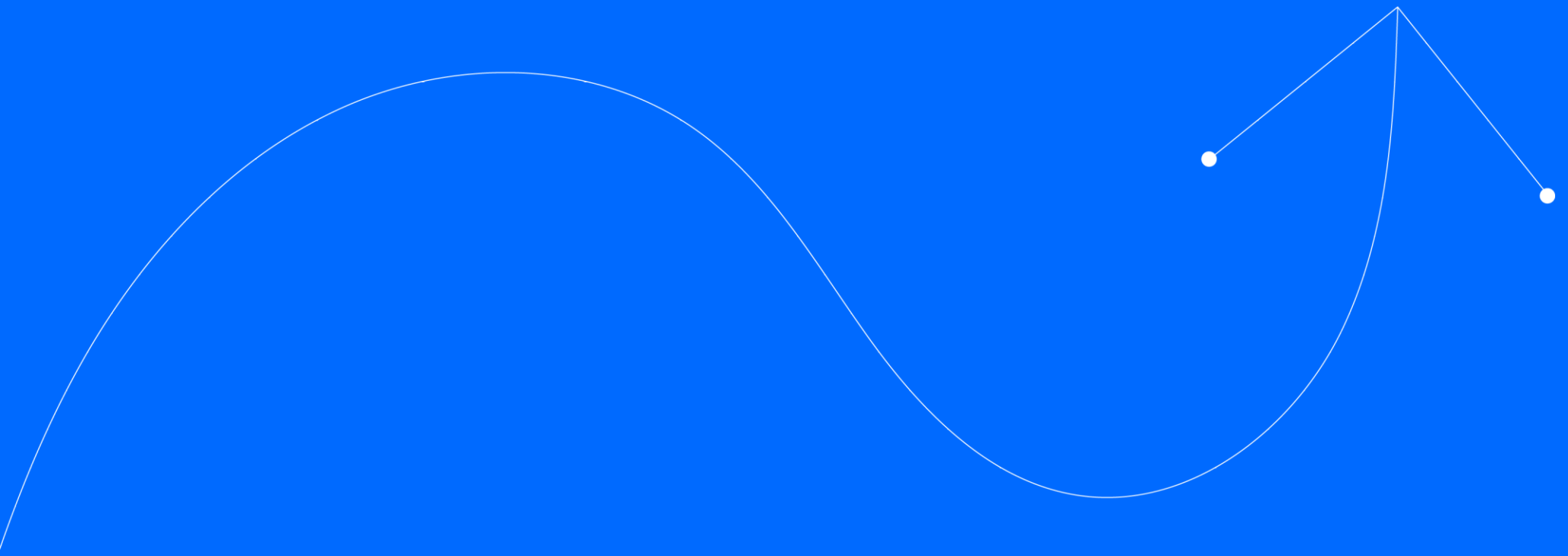
- Continued support of Clontarf Foundation and Stars Foundation across Australia to encourage and achieve Year 12 completion
- Investment in a three-year Land and Sea Management Program including Recfishwest, Clontarf Foundation and Stars Foundation students
- Santos Foundation invests in partnerships and local initiatives to help communities thrive
- Sponsor of Exmouth AFL Masters Football Carnival
- Donated new equipment and footballs to Dampier Sharks Juniors



# Santos in WA – Communities and the Environment

Santos

# THANK YOU FOR YOUR TIME



July 2025

# Consultation Report

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 Department or Agency:Department or agency of the Commonwealth | **Australian Border Force** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of the Commonwealth | **Australian Communications and Media Authority** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 476 | 23/07/2025 12:10 | Email | | Received | Australian Communications and Media Authority sent an auto-generated email to Santos acknowledging receipt of the campaign email. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of the Commonwealth | **Australian Fisheries Management Authority** | 444 | 23/07/2025 12:19 | Campaign Email | General Factsheet;Map;Fisher Factsheet | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with links to a general fact sheet and commercial fisher fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 482 | 23/07/2025 13:05 | Email | | Received | Australian Fisheries Management Authority sent a response email to Santos informing of no further comments at this present stage on Bedout Basin consultation. In addition, Australian Fisheries Management Authority confirmed Santos' correct identification of relevant fisheries for consultation and encouraged Santos to directly contact them. | Santos notes the feedback from Australian Fisheries Management Authority that it had no comments on proposed activities.<br>Santos also notes confirmation that Santos had corrected identifdied Commonwealth fisheries for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Commercial fisheries are described in Section 3.X |
| 01 Department or Agency:Department or agency of the Commonwealth | **Australian Hydrographic Office** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 609 | 15/08/2025 17:35 | Email | | Received | Santos received an auto-generated reply email from Australian Hydrographic Office in response to courtesy email. | | | |
| | | 611 | 18/08/2025 12:30 | Email | | Received | Santos received a reply email from Australian Hydrographic Office in response to a reminder email. Australian Hydrographic Office did not have any concerns on any of the activities proposed in the operational areas. Australian Hydrographic Office only requested for updates once activities are due to begin. | Santos notes feedback that it had no concerns about proposed activities and comments with respect to activity notifications.<br>Santos considers Section 25 consultation requirements to have been met. | In line with current standing arrangements, Santos will notify Australian Hydrographic Office four weeks prior to the start of activities and upon activity completion. | Activity notifications are included in Table 8-X. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 Department or Agency:Department or agency of the Commonwealth | **Australian Institute of Marine Science** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of the Commonwealth | **Australian Maritime Safety Authority - Maritime Safety** | 697 | 19/03/2025 12:00 | Meeting | | Received | Santos met with Australian Maritime Safety Authority to discuss maritime safety matters ahead of formal OPGGS Sections 25 consultation for the Bedout Multi-well Exploration environment plan. Santos presented Curie-1 drilling location as a priority for the environment plan. | | | |
| | | 698 | 29/05/2025 09:30 | Meeting | | Received | Santos met with Australian Maritime Safety Authority to follow up on meeting held on 19 March regarding Curie-1 drilling location. Australian Maritime Safety Authority completed their risk assessment and based on their findings communicated to Santos that it would not support drilling in the Curie-1 location. | Santos acknowledged Australian Maritime Safety Authority's concerns in relation to Curie-1 well, due to the drilling site being located across two shipping fairways.<br>Santos has presented a plan to AMSA Maritime Safety division to address its concerns. Santos has considered AMSA concerns when assessing impact and risk of this activity, and considers the revised control measures has reduce risk to ALARP and an acceptable level. | Refer ID 822 and 920 | BB-CM-13: Work with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel and Curie OAs.<br>BB-CM-14: If drilling in a shipping fairway, MODU Racon Unit installed prior to MODU arrival.<br>BB:CM:15: If drilling in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to electronic navigation systems (once license obtained).<br>BB:CM:16: For drilling activities within a shipping fairway, a support vessel can act in the capacity of a guard vessel in place during the activity, to reduce potential for collision or interference with other marine users.<br>BB:CM:17: Adaptive Management Plan/Vessel traffic management plan for when drilling within a shipping fairway. |
| | | 699 | 5/06/2025 06:58 | Letter | | Received | Australian Maritime Safety Authority sent Santos formal correspondence with respect to the Curie-1 drilling location in Bedout Basin as discussed in online meeting held on 29 May 2025. Formal correspondence communicated that Australian Maritime Safety Authority completed a navigational safety risk assessment of the proposed location and informed that it was unable to support drilling at the proposed location. | Santos acknowledged Australian Maritime Safety Authority's concerns in relation to Curie-1 well, due to the drilling site being located across two shipping fairways.<br>Santos has presented a plan to AMSA Maritime Safety division to address its concerns. Santos has considered AMSA concerns when assessing impact and risk of this activity, and considers the revised control measures has reduce risk to ALARP and an acceptable level. | Refer ID 822 and 920 | BB-CM-13: Work with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel and Curie OAs.<br>BB-CM-14: If drilling in a shipping fairway, MODU Racon Unit installed prior to MODU arrival.<br>BB:CM:15: If drilling in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to electronic navigation systems (once license obtained).<br>BB:CM:16: For drilling activities within a shipping fairway, a support vessel can act in the capacity of a guard vessel in place during the activity, to reduce potential for collision or interference with other marine users.<br>BB:CM:17: Adaptive Management Plan/Vessel traffic management plan for when drilling within a shipping fairway. |
| | | 700 | 25/06/2025 10:00 | Phone call | | Sent | Santos placed call to Australian Maritime Safety Authority asking for a meeting date and time to discuss risk assessment letter sent on 5 June 2025. | | | |
| | | 701 | 25/06/2025 13:55 | Meeting | | Sent | Santos sent a meeting invite to Australian Maritime Safety Authority for 8 July 2025 at 12:00pm WST with a Teams link. This meeting was held to discuss the risk assessment letter on Curie-1 drilling location in Bedout Basin. | | | |
| | | 350 | 8/07/2025 12:00 | Meeting | | Received | At 8 July 2025 meeting, Australian Maritime Safety Authority indicated to Santos that it would not be possible to drill in proposed Curie-1 location with additional controls as the main concern is for navigation of safety of vessels using the two shipping fairways. Australian Maritime Safety Authority requested Santos if it could investigate how far the Curie-1 drilling site could be offset to enable drilling in that operational area, and requested to receive shapefiles for all four operational areas applicable to this environment plan.<br>Towards end of the meeting Australian Maritime Safety Authority indicated Santos may need to consider a longer term approach across the Bedout Basin for exploration and drilling with Australian Maritime Safety Authority. | Santos acknowledged Australian Maritime Safety Authority's concerns in relation to Curie-1 well, due to the drilling site being located across two shipping fairways.<br>Santos has presented a plan to AMSA Maritime Safety division to address its concerns. Santos has considered AMSA concerns when assessing impact and risk of this activity, and considers the revised control measures has reduce risk to ALARP and an acceptable level.<br><br>Santos has provided the shapefiles requested (refer ID464), and responded to AMSA's query on how far the Curie-1 drilling site could be offset (refer ID578). | Refer ID 464, 578, 822 and 920 | BB-CM-13: Work with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel and Curie OAs.<br>BB-CM-14: If drilling in a shipping fairway, MODU Racon Unit installed prior to MODU arrival.<br>BB:CM:15: If drilling in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to electronic navigation systems (once license obtained).<br>BB:CM:16: For drilling activities within a shipping fairway, a support vessel can act in the capacity of a guard vessel in place during the activity, to reduce potential for collision or interference with other marine users.<br>BB:CM:17: Adaptive Management Plan/Vessel traffic management plan for when drilling within a shipping fairway. |
| | | 464 | 14/07/2025 16:20 | Email | Map | Sent | Santos sent an email to the Australian Maritime Safety Authority sharing shapefiles for the operational areas in the Bedout Basin - Curie, Mestrel, Wallace, Ara 435 and Ara 436. Santos also informed that information will be provided in due course on how far Santos can offset the Curie drilling location from the two shipping fairways. | Santos provided the shapefiles of the operating areas requested by AMSA.<br>Santos considers the request from AMSA does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | | |
| | | 521 | 30/07/2025 12:25 | Email | | Sent | Santos sent an email to Australian Maritime Safety Authority to follow up on receipt of Bedout operational area shapefiles for this environment plan as discussed and requested at online meeting held on 8 July 2025. | | | |
| | | 522 | 31/07/2025 09:40 | Email | | Received | Australian Maritime Safety Authority sent an email to Santos to confirm receipt of Bedout operational areas' shape files for this environment plan consultation. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 571 | 19/08/2025 09:10 | Phone call | | Sent | Santos called AMSA and asked to speak with someone in Maritime Safety to follow up on consultation for this EP that was closing on 22 August 2025. AMSA advised that the best option was to email amsaconnect@amsa.gov.au to follow up. | | | |
| | | 613 | 19/08/2025 09:40 | Email | | Sent | Santos sent a reminder email to Australian Maritime Safety Authority on consultation of this environment and closing date for consultation period was Friday, 22 August 2025. Links to both the General and Fishers Fact Sheets were provided. | | | |
| | | 572 | 19/08/2025 09:41 | Reminder Email | General Factsheet;Map | Sent | Santos sent a follow up reminder email to Australian Maritime Safety Authority on closing of consultation on 22 August 2025 copied to Maritime Safety branch. | | | |
| | | 578 | 20/08/2025 11:30 | Meeting | | Sent | Santos initiated at 20 August 2025 meeting with AMSA Maritime Safety to consider a proposal to temporarily deviate the two shipping fairways across the Curie drilling location for this environment plan. Santos to provide to AMSA in approximately four to six weeks.<br>At this meeting, Santos confirmed back to AMSA that it was not possible to move location of drilling well in Curie OA. | Santos notes that AMSA Maritime Safety will require consideration of all risks to navigation of safety to temporarily deviate the two shipping fairways to enable drilling in Curie location.<br>Santos considers the request from AMSA does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | Refer ID 822 and 920 | BB-CM-13: Work with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel and Curie OAs.<br>BB-CM-14: If drilling in a shipping fairway, MODU Racon Unit installed prior to MODU arrival.<br>BB:CM:15: If drilling in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to electronic navigation systems (once license obtained).<br>BB:CM:16: For drilling activities within a shipping fairway, a support vessel can act in the capacity of a guard vessel in place during the activity, to reduce potential for collision or interference with other marine users.<br>BB:CM:17: Adaptive Management Plan/Vessel traffic management plan for when drilling within a shipping fairway. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 702 | 22/08/2025 15:59 | Letter | | Sent | Santos sent a follow up email and letter to Australian Maritime Safety Authority - Maritime Safety to confirm initiation of collaboration with AMSA on temporarily deviating shipping fairways in Bedout Basin moving forward. | | | |
| | | 589 | 22/08/2025 15:59 | Email | | Sent | Santos emailed Australian Maritime Safety Authority - Maritime Safety a letter confirming Santos is keen to work closely with AMSA to safely deviate shipping fairways where there are drilling locations across the Bedout Basin. | | | |
| | | 726 | 22/09/2025 16:54 | Email | | Sent | Santos sent an email to Australian Maritime Safety Authority - Marine Safety informing Santos is working on the proposal to temporarily deviate shipping fairways across Curie operational area. Santos informed the proposal would be sent to AMSA Marine Safety on 15 October and asked for a meeting to discuss proposal on either 22 or 29 October 2025. | | | |
| | | 727 | 22/09/2025 16:55 | Email | | Received | Australian Maritime Safety Authority - Marine Safety's Principal Advisor Navigation Safety sent an auto-generated email informing that they are on leave from 19-22 September 2025. | | | |
| | | 728 | 23/09/2025 11:27 | Email | | Received | Australian Maritime Safety Authority - Marine Safety's Principal Advisor Navigation Safety sent an email to Santos to confirm online meeting for 29 October 2025 to discuss proposal on temporarily deviating shipping fairways across Curie operational area. | | | |
| | | 729 | 23/09/2025 11:34 | Email | | Received | Australian Maritime Safety Authority - Maritime Safety's Principal Advisor Navigation Safety sent an email to Santos to confirm time of meeting on 29 October 2025. | | | |
| | | 730 | 23/09/2025 11:45 | Meeting | | Sent | Santos sent a meeting invite to Australian Maritime Safety Authority - Maritime Safety to meet online on Wednesday, 29 October 2025 from 10-11am WST. | | | |
| | | 822 | 15/10/2025 13:50 | Email | | Sent | Santos sent its proposal to Australian Maritime Safety Authority for its recommendation for proposed management of shipping fairways in the Bedout Basin to assist with exploration of drilling wells that are located within shipping fairways. The priority of drilling locations put forward were Curie-1 and Goats Eye-1. The addition of Goats Eye-1 location was to further inform AMSA Maritime Safety of Santos' adaptive drilling sequence beyond this environment plan. | Santos acknowledged Australian Maritime Safety Authority's concerns in relation to Curie-1 well, due to the drilling site being located across two shipping fairways.<br>Santos has presented a plan to AMSA Maritime Safety division to address its concerns. Santos has considered AMSA concerns when assessing impact and risk of this activity, and considers the revised control measures has reduce risk to ALARP and an acceptable level. | Refer ID 920 | BB-CM-13: Work with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel and Curie OAs.<br>BB-CM-14: If drilling in a shipping fairway, MODU Racon Unit installed prior to MODU arrival.<br>BB:CM:15: If drilling in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to electronic navigation systems (once license obtained).<br>BB:CM:16: For drilling activities within a shipping fairway, a support vessel can act in the capacity of a guard vessel in place during the activity, to reduce potential for collision or interference with other marine users.<br>BB:CM:17: Adaptive Management Plan/Vessel traffic management plan for when drilling within a shipping fairway. |
| | | 824 | 16/10/2025 05:50 | Email | | Received | Australian Maritime Safety Authority replied back to Santos to acknowledge receipt of Santos' proposal on proposed Bedout Basin Shipping Fairways Management, and to review proposal for meeting booked in on 29 October 2025. | | | |
| | | 865 | 22/10/2025 00:00 | Email | | Sent | Santos sent an email to Australian Maritime Safety Authority meeting agenda for online meeting on 29 October 2025. | | | |
| | | 920 | 29/10/2025 00:00 | Meeting | | Sent | Santos met with AMSA Marine Safety to discuss Santos' proposal sent on 15 October 2025 to modify shipping fairways across drilling locations in the Bedout sub-basin. AMSA was informed of the adaptive drilling sequence beyond Curie operational area that now lists Goats Eye-1. AMSA was appreciative of the early engagement on future Bedout sub-basin activities (EP2). AMSA informed that they would need to meet with NOPSEMA to discuss Santos' proposal. | Santos acknowledged Australian Maritime Safety Authority's concerns in relation to Curie-1 well, due to the drilling site being located across two shipping fairways.<br>Santos has presented a plan to AMSA Maritime Safety division to address its concerns. Santos has considered AMSA concerns when assessing impact and risk of this activity, and considers the revised control measures has reduce risk to ALARP and an acceptable level. | No response required. | BB-CM-13: Work with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel and Curie OAs.<br>BB-CM-14: If drilling in a shipping fairway, MODU Racon Unit installed prior to MODU arrival.<br>BB:CM:15: If drilling in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to electronic navigation systems (once license obtained).<br>BB:CM:16: For drilling activities within a shipping fairway, a support vessel can act in the capacity of a guard vessel in place during the activity, to reduce potential for collision or interference with other marine users.<br>BB:CM:17: Adaptive Management Plan/Vessel traffic management plan for when drilling within a shipping fairway. |
| | | 915 | 29/10/2025 00:00 | Email | | Sent | Santos emailed Australian Marine Safety Authority - Marine Safety a map of drilling locations in Bedout sub-basin that would go across two environment plans.<br>Information was also provided on the adaptive drilling sequence in the sub-basin. This information assisted in informing AMSA on the future plan to drill and develop projects in the sub-basin. | Santos acknowledged Australian Maritime Safety Authority's concerns in relation to Curie-1 well, due to the drilling site being located across two shipping fairways.<br>Santos has presented a plan to AMSA Maritime Safety division to address its concerns. Santos has considered AMSA concerns when assessing impact and risk of this activity, and considers the revised control measures has reduce risk to ALARP and an acceptable level. | Refer ID1438 | BB-CM-13: Work with AMSA to facilitate temporary modification of shipping fairway traffic during drilling activities within the Mestrel and Curie OAs.<br>BB-CM-14: If drilling in a shipping fairway, MODU Racon Unit installed prior to MODU arrival.<br>BB:CM:15: If drilling in a shipping fairway, AIS Aid to Navigation (AtoN) device to transmit MODU position to electronic navigation systems (once license obtained).<br>BB:CM:16: For drilling activities within a shipping fairway, a support vessel can act in the capacity of a guard vessel in place during the activity, to reduce potential for collision or interference with other marine users.<br>BB:CM:17: Adaptive Management Plan/Vessel traffic management plan for when drilling within a shipping fairway. |
| | | 1438 | 12/11/2025 9:30 | Email | | Sent | Santos emailed Australian Maritime Safety Authority - Marine Safety a courtesy letter sharing the control measures for drilling in shipping fairways to be placed into the Bedout Multi-well Exploration and Drilling Appraisal Environment Plan. | | No response required. | Section 6.1 Interaction with other Marine Users; Section 7.7 Vessel Collision |
| | | 1509 | 19/11/2025 12:06 | Phone call | | Sent | Santos called and left a message with Australian Maritime Safety Authority - Marine Safety to follow up if letter sent on 12 November was received. | | | |
| | | 1531 | 20/11/2025 8:41 | Email | | Received | Santos received an email from Australian Maritime Safety Authority - Marine Safety to confirm receipt of letter. AMSA - Maritime Safety also informed that the organisation is still considering Santos' proposal on modification to shipping fairways to drill in operational areas located in shipping fairways. | In acknowledging Australian Maritime Safety Authority - Maritime Safety's concerns to Curie-1 well, Santos has presented a plan to AMSA Maritime Safety division.<br>Santos has separately written to AMSA to outline the control measures for drilling shipping fairways which it intends to implement in the drilling EP (refer ID915), and therefore Santos considers Section 25 consultation requirements have been met. | No response required. | Section 6.1 Interaction with other Marine Users; Section 7.7 Vessel Collision; Section 8.12 Post Acceptance Consultation Implementation Strategy |
| | | 1665 | 10/12/2025 12:52 | Email | | Sent | Santos sent an email to Australian Maritime Safety Authority - Maritime Safety to inform that the Bedout Multi-well Exploration and Appraisal Drilling EP was out for public comment on NOPSEMA website until 8 January 2026.<br>Santos requested a meeting prior to 18 December 2025 to receive feedback on Santos' proposal. | | | |
| | | 1666 | 12/12/2025 11:18 | Phone call | | Sent | Santos left a voicemail for Australian Maritime Safety Authority - Maritime Safety to follow up on its email sent on 10 December 2025 requesting a meeting before 18 December 2025 to receive feedback on its proposal on shipping fairway management. | | | |
| | | 1668 | 18/12/2025 12:00 | Meeting | | | Australian Maritime Safety Authority - Maritime Safety met with Santos via Teams on Thursday, 18 December 2025 from 12-12.30pm WST.<br>Australian Maritime Safety Authority - Maritime Safety informed Santos that it had reviewed Santos' risk assessment and that its position on the proposal had not changed since meeting held in October 2025.<br>Australian Maritime Safety Authority - Maritime Safety also communicated that NOPSEMA was the decision maker of the EP and would consider AMSA's recommendations for drilling in shipping fairways. In addition, Australian Maritime Safety Authority - Maritime Safety also communicated that they will wait until to hear what NOPSEMA decides before Santos and AMSA can find a way to work together moving forward.<br>Australian Maritime Safety Authority - Maritime Safety communicated that it would provide official feedback on the proposal to NOPSEMA on 19 December 2025 and also directly to Santos soon after. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1852 | 9/01/2026 11:10 | Email | | Sent | Santos sent an email to Australian Maritime Safety Authority - Maritime Safety to follow up on feedback and position to the proposal sent on 15 October 2025. | | | |
| | | 1853 | 12/01/2026 8:35 | Email | | Received | Santos received reply email from Australian Maritime Safety Authority - Maritime Safety informing that NOPSEMA would share AMSA's recommendations on the proposal. | | | |
| | | 1854 | 13/01/2026 10:26 | Email | | Sent | Santos emailed Australian Maritime Safety Authority - Maritime Safety to confirm Santos had received its recommendations on the proposal via NOPSEMA. | | | |
| | | 1855 | 12/01/2026 10:39 | Email | | Received | NOPSEMA shared the 19 December 2025 correspondence from the Australian Maritime Safety Authority - Maritime Safety in relation to Santos' proposal of management of shipping fairways for exploration activities in Bedout Basin.<br>The correspondence informed Santos that the Australian Maritime Safety Authority - Maritime Safety considered that the proposal did not reduce collision or allision risk to acceptable levels in relation to:<br>1) Exclusion zones<br>2) Standard mitigation measures<br>3) Additional mitigation measures<br>4) Ships' regional routeing measures<br>5) Modification or temporary shifting of shipping fairways<br><br>In that correspondence the Australian Maritime Safety Authority - Maritime Safety informed NOPSEMA that it exploratory drilling should not occur within recommended shipping fairways. | Santos notes Australian Maritime Safety Authority - Maritime Safety's comments from 19 December 2025 correspondence and have informed the authority that resubmission of environment plan will address their comments. | Refer ID-1873 - ID-1878 | Section 2.1.2<br>Section 6.1 Interaction with other Marine Users<br>Section 6.1 Table 6-2, Table 7-4, Table 8-2<br>Section 7.7 Vessel Collision<br>Section 8.12 Post Acceptance Consultation Implementation Strategy |
| | | 1872 | 29/01/2026 09:15 | Phone call | | | Santos called the Australian Maritime Safety Authority - Maritime Safety and advised that it would provide a response to its correspondence by email. Santos also asked if Australian Maritime Safety Authority - Maritime Safety wished to raise any additional matters further to its letter of 19 December 2025.<br>AMSA confirmed there were no additional matters for discussion ahead of a decision from NOPSEMA. | Santos considers Section 25 consultation requirements have been met. | Refer ID-1873 - ID-1878 | |
| | | 1873 | 29/01/2026 11:51 | Email | | | Santos sent an email to the Australian Maritime Safety Authority - Maritime Safety and acknowledged receipt of its correpondence in relation to<br>1) Exclusion zones<br>2) Standard mitigation measures<br>3) Additional mitigation measures<br>4) Ships' regional routeing measures<br>5) Modification or temporary shifting of shipping fairways<br>Refer ID-1855 for further detail on Australian Maritime Safety Authority - Maritime Safety's feedback.<br><br>Santos also advised that the EP was being resubmitted to NOPSEMA inclusive of proposed control measures in Santos' 15 October 2025 proposal to temporarily re-route shipping fairways. | Santos' assessment of merits for each comment made by Australian Maritime Safety Authority - Maritime Safety are listed below.<br><br>Santos has assessed the feedback from the Australian Maritime Safety Authority - Maritime Safety does not raise any additional claims or objections beyond those previously raised and considered by Santos as set out above. | No response required. | Section 2.1.2<br>Section 6.1 Interaction with other Marine Users<br>Section 6.1 Table 6-2, Table 7-4, Table 8-2<br>Section 7.7 Vessel Collision<br>Section 8.12 Post Acceptance Consultation Implementation Strategy |
| | | 1874 | 29/01/2026 11:51 | Email | | Sent | Australian Maritime Safety Authority - Maritime Safety commented that exclusion zones of 500 to 2,000 meters around exploratory drilling operations would encroach on established fairways, reduce sea room for large vessels, and elevate the risk of collision or allision. | Santos acknowledged comments from Australian Maritime Safety Authority - Maritime Safety, noting that the 500 m Petroleum Safety Zone (PSZ) was a mandatory exclusion zone around drilling rigs, wells, and structures prohibiting unauthorized vessels to ensure safety, as regulated by NOPSEMA under the OPGGS Act (2006).<br>Santos noted that a temporary wider Cautionary Zone of 2,000 m was required only for the period during which mooring equipment is being put in place which is expected to take approximately 48 hours.<br>Santos recognised that the recommended shipping fairways within which exploration wells are proposed are an adequate width at 3 nm (~5.6 km), such that even the 2,000 m cautionary zone, assuming a drilling rig positioned directly in the centre of shipping lane would leave 800 m on either side of the drilling rig available for vessel traffic whilst mooring operations are being undertaken and 2,300 m during drilling operations.<br>Santos re-affirmed it was not proposing to drill within an active shipping fairway and instead recommends temporary re-routing to alternative fairways to address this risk.<br>Santos' risk assessment indicates the residual risk for re-routing maritime traffic in comparison to temporary deviation of shipping fairways is low and deemed acceptable without further mitigation considering the other controls proposed and those already in place. | Santos' response to Australian Maritime Safety Authority - Maritime Safety is set out in the assessment of merits column. No further response required. | Section 2.1.2<br>Section 6.1 Interaction with other Marine Users<br>Section 6.1 Table 6-2, Table 7-4, Table 8-2<br>Section 6.1.3 Environmental Performance Outcomes and Control Measures |
| | | 1875 | 29/01/2026 11:51 | Email | | Sent | Australian Maritime Safety Authority - Maritime Safety commented that the residual risk to SOLAS-class vessels (including very large tankers and bulk carriers) remained unacceptably high, even with standard mitigation measures, such as Notices to Mariners, lighting, and exclusion zones. | Santos acknowledged comments from Australian Maritime Safety Authority - Maritime Safety, noting that standard risk mitigation measures (such as Notices to Mariners, lighting and exclusion zones) were important controls but in isolation were inadequate to mitigate risk of collision or allision to ALARP.<br>Santos commented that the use of administrative controls (Notices to Mariners and exclusion zones) with single engineering control (lighting) were proposed to be further supplemented with additional higher effectiveness controls of elimination (re-routing of fairways), substitution (deviation of fairways) and additional engineering controls (AIS, radar beacons and support vessels).<br>Santos viewed elimination (re-routing of fairways) or substitution (deviation of fairways) as highly effective controls which would effectively eliminate interactions between drilling operations and maritime traffic and considered them to be ALARP. This would eliminate risk of collision and allision, potential near misses due to reduced fairway width and limited manoeuvrability of SOLAS-class vessels.<br>Santos further noted that vessel traffic according to AIS shipping data was approximately 300 vessels per month (equating to 1 vessel every two and a half hours). This low traffic volume further reduced allision and collision risk for large vessels with limited maneuverability such as SOLAS-class due to the limited interaction within the fairway. | Santos' response to Australian Maritime Safety Authority - Maritime Safety is set out in the assessment of merits column. No further response required. | Section 6.1 Interaction with other Marine Users<br>Section 6.1 Table 6-2, Table 7-4, Table 8-2<br>Section 6.1.3 Environmental Performance Outcomes and Control Measures<br>Section 6.1.5.1 Demonstration of As Low as Reasonably Practicable |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1876 | 29/01/2026 11:51 | Email | | Sent | Australian Maritime Safety Authority - Maritime Safety commented that it had considered additional measures, including infrastructure marked by automatic identification system (AIS), radar beacons and support vessels, but determined these were insufficient to reduce navigational risk to acceptable levels. | Santos acknowledged comments from Australian Maritime Safety Authority - Maritime Safety, noting that further to the controls mentioned above, Santos also proposed to utilise AIS for the MODU and support vessels, as well as radar beacons. These are considered to be effective controls that significantly reduce navigational risk.<br>Santos also advised it would have a vessel in close proximity to the MODU at all times which will be able to provide guarding and assist with contacting and deviating any errant vessels that inadvertently approach the MODU.<br>Santos emphasised that the MODU was highly visible both during daylight and nighttime conditions due to its size and lighting from kilometres away. The MODU will have 24-hour support of a dedicated Radio Operator on board who will maintain contact with the support vessel(s) as well as any other nearby maritime traffic. | Santos' response to Australian Maritime Safety Authority - Maritime Safety is set out in the assessment of merits column. No further response required. | Section 6.1 Interaction with other Marine Users<br>Section 6.1 Table 6-2, Table 7-4, Table 8-2<br>Section 6.1.3 Environmental Performance Outcomes and Control Measures<br>Section 6.1.5.1 Demonstration of As Low as Reasonably Practicable |
| | | 1877 | 29/01/2026 11:51 | Email | | Sent | Australian Maritime Safety Authority - Maritime Safety commented that temporary adjustments to the location of shipping fairways established in 2012 to optimise navigational safety and fuel-efficient transit to and from international ports would disrupt established vessel traffic patterns and increase navigational risk. | Santos acknowledged comments from Australian Maritime Safety Authority - Maritime Safety, noting that temporary fairway re-routing or deviation was an established tool frequently utilised globally to preserve navigational safety during both short-term and long-term activities and operations.<br>Santos recognises that temporary fairway re-routing or deviation is an established tool to preserve navigational safety during both short term and long-term activities and operations that is utilised both within Australia and internationally<br>Santos recognised that high compliance with temporary re-routing and deviations to fairways was expected and that not all marine vessels adhere to these chartered shipping fairways. With controls outlined above (lighting, AIS, radar beacons and support vessel providing guarding and re-routing), it would be possible to avoid an allision or collision in the event of a non-compliance with updated fairway recommendations.<br>Based on all the control measures outlined above, Santos has assessed the risk of drilling a well once shipping fairways have been re-routed such that it is low risk and deemed acceptable for vessel traffic. | Santos' response to Australian Maritime Safety Authority - Maritime Safety is set out in the assessment of merits column. No further response required. | Section 6.1 Interaction with other Marine Users<br>Section 6.1 Table 6-2, Table 7-4, Table 8-2<br>Section 6.1.3 Environmental Performance Outcomes and Control Measures<br>Section 6.1.5.1 Demonstration of As Low as Reasonably Practicable |
| | | 1878 | 29/01/2026 11:51 | Email | | Sent | Australian Maritime Safety Authority - Maritime Safety commented that modifying existing fairways or temporarily shifting them would take significant time and international vessels were unlikely to adopt these changes as when generally established those routes were disrupted, many vessels revert to direct, shorter paths, bypassing the altered lanes entirely. This behaviour increases navigational risk rather than mitigating it, compounding collision risk. | Santos acknowledged comments from Australian Maritime Safety Authority - Maritime Safety, noting that transit efficiency had been assessed as part of the proposed fairway modifications and were deemed to have negligible impact. Deviations to shipping routes have been calculated to account for only 1 – 3% of the shipping distances for vessels on international routes, for example to Indonesia. Santos recognised that vessels may elect to bypass recommended shipping fairways if routes were materially longer; however, the incremental distance was not sufficiently material to expect this to occur.<br><br>Santos has been engaging with the Australian Maritime Safety Authority - Maritime Safety since 19 Mar 2025. The Australian Maritime Safety Authority - Maritime Safety has advised Santos that its position is that exploratory drilling should not occur within recommended shipping fairways. Santos has considered the viability of alternative drilling proposals (see Section 6.1.5 of the EP) and, it has introduced control measures in the EP to reduce the concerns raised by the authority to an ALARP and an acceptable level. Santos has also been informed by the authority that it does not have any further matters to discuss prior to an acceptance decision from NOPSEMA. As such, Santos considers s25 consultation requirements to have been met. | Santos' response to Australian Maritime Safety Authority - Maritime Safety is set out in the assessment of merits column. No further response required. | Section 6.1.5 Demonstration of As Low as Reasonably Practicable<br>Section 6.1.5.1 Management of shipping fairways and safety of navigation |
| 01 Department or Agency:Department or agency of the Commonwealth | **Department of Agriculture, Fisheries and Forestry - Biosecurity Marine Pests** | 444 | 23/07/2025 12:19 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 480 | 23/07/2025 12:20 | Email | | Received | Department of Agriculture, Fisheries and Forestry - Conveyance Policy sent an auto-generated email to Santos acknowledging receipt of the campaign email. | | | |
| | | 561 | 14/08/2025 11:43 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of the Commonwealth | **Department of Agriculture, Fisheries and Forestry - Fisheries Division** | 444 | 23/07/2025 12:19 | Campaign Email | General Factsheet;Map;Fisher Factsheet | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with links to a general fact sheet and commercial fisher fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 561 | 14/08/2025 11:43 | Reminder Email | General Factsheet;Map;Fisher Factsheet | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 Department or Agency:Department or agency of the Commonwealth | **Department of Climate Change, Energy, the Environment and Water - Director of National Parks** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 612 | 18/08/2025 14:40 | Email | | Received | Santos received a reply email from Director of National Parks at Department of Climate Change, Energy, the Environment and Water informing that there are no objections to the activities in relation to the operational areas. Further, no authorisation requirements required of Santos to the DNP. | Santos notes the feedback from the Director of National Parks that it had no objections in relation to proposed activities.<br>Santos also notes confirmation that no authorisations were required for proposed activities.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Protected areas including marine parks are described in Section 3.X |
| 01 Department or Agency:Department or agency of the Commonwealth | **Department of Climate Change, Energy, the Environment and Water - Underwater Cultural Heritage** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 577 | 19/08/2025 09:14 | Phone call | | Sent | Santos called the Department of Climate Change, Energy, the Environment and Water and asked to be directed to the Underwater Cultural Heritage Division. The Department conact person advised that the Underwater Cultural Heritage Division did not have a direct line and advised that the preferred communications channel was visa email to underwaterheritage@dcceew.gov.au email. The contact person also asked for Santos' contact details for passing on to the Underwater Cultural Heritage Division. | | | |
| | | 615 | 19/08/2025 12:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent a reminder email for close of consultation on the environment plan after trying to engage with an associate from the Underwater Cultural Heritage division within Department of Climate Change, Energy, the Environment and Water via phone. Santos was informed that the only contactable channel was via this email address. A link to the General Fact Sheet was provided in email. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of the Commonwealth | **Department of Defence** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of the Commonwealth | **Department of Foreign Affairs and Trade** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 Department or Agency:Department or agency of the Commonwealth | **Department of Industry, Science and Resources** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of the Commonwealth | **Fisheries Research and Development Corporation** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of the Commonwealth | **Indigenous Land and Sea Council** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of the Commonwealth | **National Indigenous Australians Agency** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation.<br><br>Consultation Manager progam confirmed that email was received by NIAA on 23 July 2025. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025.<br>Email dropped. | | | |
| | | 709 | 15/09/2025 14:37 | Phone call | | Sent | Santos called Perth Regional Office on landline to seek appropriate email address to send a reminder email to National Indigenous Australians Agency as the reminder email was not received on 14 August 2025 to the Canberra Head Office email address. Santos did not speak with anyone as the call was not picked up or answered after hanging on for two minutes. | | | |
| | | 710 | 15/09/2025 14:55 | Reminder Email | | Sent | Santos sent a reminder email to the National Indigenous Australians Agency as the initial reminder email was not received by the Canberra head office email on 14 August 2025 (email bounced). This reminder email included the Perth regional office email address to offer opportunity for National Indigenous Australians Agency to provide feedback on this environment plan by 22 September 2025. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 718 | 15/09/2025 14:58 | Email | | Received | National Indigenous Australians Agency's Greater Western Australia sent Santos an autogenerated email informing that the agency will respond within two business days. The main email address sent to for this agency, enquiries@niaa.gov.au, did not send an autogenerated email. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Department of Biodiversity, Conservation and Attractions** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 478 | 23/07/2025 12:10 | Email | | Received | Department of Biodiversity, Conservation and Attractions sent an auto-generated email to Santos indicating that Santos email will be forwarded to the relevant area of the department for direct response. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 579 | 20/08/2025 14:40 | Phone call | | Sent | Santos called and spoke with a Department of Biodiversity, Conservation and Attractions contact to inform the Department that consultation was closing on 22 August 2025. | | | |
| | | 696 | 22/08/2025 14:25 | Email | | Received | Department of Biodiversity, Conservation and Attractions (DBCA) sent an email to Santos providing comment on this environment plan in relation to:<br>1) Proposed activities in proximity to biologically important areas for conservation;<br>2) Baseline survey data;<br>3) Monitoring reports;<br>4) Department of Climate Change, Energy, the Environment and Water's National Light Pollution Guidelines for Wildlife;<br>5) Incidents and emergency response; and<br>6) Marine pollution. | Santos notes Department of Biodiversity, Conservation and Attractions' (DBCA) comments and have informed the department on the appropriate sections of the environment plan to address their comments. | Refer ID632 | |
| | | 632 | 25/08/2025 16:25 | Email | | Sent | Santos sent an email to Department of Biodiversity, Conservation and Attractions' comments in relation to this environment plan covering:<br>1) Proposed activities in proximity to biologically important areas for conservation;<br>2) Baseline survey data;<br>3) Monitoring reports;<br>4) Department of Climate Change, Energy, the Environment and Water's National Light Pollution Guidelines for Wildlife;<br>5) Incidents and emergency response; and<br>6) Marine pollution.<br>Refer ID 712-716 for further detail on DBCA's feedback | Santos' assessment of merits for each comment made by Department of Biodiversity, Conservation and Attractions are listed below.<br><br>Santos considers each request from DBCA does not raise an objection or claim about the adverse impacts of each activity to which the EP relates.<br>As such, Santos considers s25 consultation requirements to have been met. | Refer ID711-716 | |
| | | 711 | 25/08/2025 16:25 | Email | | Sent | DBCA commented that it is considered essential that baseline values and state of potentially affected environment are documented prior to operations commencing that have the potential to lead to hydrocarbon releases.<br><br>Refer ID 712-716 for further detail on DBCA's feedback. | Santos acknowledges there are ecologically important areas located in the vicinity of the proposed operations, and within the wider EMBA. The values and sensitivities are documented in Section 3 (Existing Environment) of the EP provides the state of environment to inform the risk and impacts of the proposed activities.<br><br>In addition, the potential area that could be affected by an unplanned hydrocarbon release are risk and impact assessed in Sections 7.6 (Unplanned Hydrocarbon Release - Loss of Well Control) and 7.7 (Unplanned Hydrocarbon Release – Marine Diesel oil) of the EP, with appropriate measures applied to reduce the potential risk and impacts to ALARP and acceptable levels. | Santos' response to DBCA is set out in the assessment of merits column. No further response required. | Sections 7.6 (Unplanned Hydrocarbon Release - Loss of Well Control) and 7.7 (Unplanned Hydrocarbon Release – Marine Diesel oil) |
| | | 712 | 25/08/2025 16:25 | Email | | Sent | DBCA commented that it would like like to have confidence that Santos has established appropriate baseline data on the current state of areas supporting important ecological values and any current contamination, if present within the EMBA. | Santos is confident that its risk and impact assessment process, baseline survey data review, and OSMP, addresses potential impacts on ecological values and recovery of these values. | Santos' response to DBCA is set out in the assessment of merits column. No further response required. | Sections 7.6 (Unplanned Hydrocarbon Release - Loss of Well Control);<br>Section 7.7 (Unplanned Hydrocarbon Release - Marine Diesel oil);<br>Section 5 (Environmental Risk and Impact Assessment) |
| | | 713 | 25/08/2025 16:25 | Email | | Sent | DBCA commented that Santos should be aware that the monitoring in marine parks and reserves is to inform DBCA's values and objectives in relation to marine park management. Further encourages Santos to implement a before-after, control-impact framework in planning and evaluating its management response. | Santos acknowledges the monitoring reports available from the DBCA website and has considered these when assessing impact and risk of this activity. | Santos' response to DBCA is set out in the assessment of merits column. No further response required. | Not applicable. |
| | | 714 | 25/08/2025 16:25 | Email | | Sent | DBCA recommended that Santos to refer to the Commonwealth Department of Climate Change, Energy, the Environment and Water's National Light Pollution Guidelines for Wildlife as best practice industry standard for managing potential impacts of light pollution on marine fauna. | Santos has referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water's National Light Pollution Guidelines for Wildlife as a best-practice industry standard for managing potential impacts of light pollution on marine fauna (https://www.dcceew.gov.au/environment/biodiversity/publications/national-light-pollution-guidelines-wildlife) for its impact assessment of light emissions within Section 6.3 of the EP. | Santos' response to DBCA is set out in the assessment of merits column. No further response required. | Section 6.3 of EP |
| | | 715 | 25/08/2025 16:25 | Email | | Sent | DBCA requested that Santos notify DBCA's Pilbara regional office in the event of a hydrocarbon release. | Santos confirms in the event of a hydrocarbon release, it will notify DBCA's Pilbara office as soon as practicable on telephone number 08 9182 2000. Santos will also work with the Department of Transport (DoT) to ensure effective management, monitoring and clean-up of any DBCA interests if affected by an oil spill, in consultation with DBCA.<br>Santos also acknowledges DBCA's advice 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 led by DoT (state's Hazard Management Agency) and any advice or assistance from DBCA, at any scale, will occur on a full cost recovery basis.<br>Santos also commits to consult with DBCA as required on monitoring and clean-up activity in the event of an oil spill and this commitment will be reflected in the OPEP. | Santos' response to DBCA is set out in the assessment of merits column. No further response required. | OPEP |
| | | 716 | 25/08/2025 16:25 | Email | | Sent | DBCA has referred Santos to the Department of Transport's documents providing information on the WA emergency management arrangements for marine oil pollution incidents in state waters. | Santos has referred to the Department of Transport's (DoT) web content regarding marine pollution (https://www.transport.wa.gov.au/imarine/marine-pollution.asp), and the Offshore Petroleum Industry Guidance Note of July 2020 titled Marine Oil Pollution: Response and Consultation Arrangements in developing the EP and the OPEP. This includes providing the final draft of the OPEP for DoT's review. | Santos' response to DBCA is set out in the assessment of merits column. No further response required. | OPEP |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 Department or Agency:Department or agency of Western Australia | **Department of Creative Industries, Tourism and Sport (formerly Department of Jobs, Tourism, Science and Innovation)** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Department of Mines, Petroleum and Exploration (formerly Department of Energy, Mines, Industry Section and Safety)** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Department of Planning, Lands and Heritage** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 473 | 23/07/2025 12:10 | Email | | Received | Department of Planning, Lands and Heritage sent an auto-generated email to Santos acknowledging receipt of the campaign email. | | | |
| | | 587 | 4/08/2025 13:05 | Email | | Received | Department of Planning, Lands and Heritage sent an email to Santos advising it had no comments on the proposed activity as the proposed activities are within Commonwealth waters. | Santos notes the feedback from the Department of Planning, Lands and Heritage that it had no comments in relation to proposed activities.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Cultural heritage is described in Section 3.X |
| 01 Department or Agency:Department or agency of Western Australia | **Department of Primary Industries and Regional Development** | 441 | 23/07/2025 11:56 | Campaign Email | General Factsheet;Map;Fisher Factsheet | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with links to a general fact sheet and commercial fisher fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 559 | 14/08/2025 11:34 | Reminder Email | General Factsheet;Map;Fisher Factsheet | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 575 | 19/08/2025 09:12 | Phone call | | Sent | Santos called the Department of Primary Industries and Regional Development and left a voicemail regarding consultation on the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. The voicemail referenced the closing date of consultation on 22 August 2025 and a return contact number. | | | |
| | | 576 | 19/08/2025 09:56 | Phone call | | Received | A contact from the Department of Primary Industries and Regional Development (DPIRD) called Santos and advised it had not received the consultation email and materials for the Bedout Multi-well Exploration and Drilling Appraisal Environment Plan. DPIRD requested additional time for response due to the number of enquiries that they have. | | | |
| | | 614 | 19/08/2025 10:20 | Email | | Sent | Santos sent a follow up email after receiving a phone call from Department of Primary Industries and Regional Development - Fisheries requesting for information to be sent to a different email address. | | | |
| | | 630 | 21/08/2025 15:40 | Email | | Received | Department of Primary Industries and Regional Development (DPIRD) sent an email to Santos requesting for consultation fact sheets to be sent to them as the links to consultation information did not work. In addition, DPIRD requested an extension of time to provide feedback . DPIRD further informed to ensure that future consultations to be sent directly to the Environment Group via their email address. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 667 | 1/09/2025 09:35 | Email | | Sent | Santos sent a follow up email to Department of Primary Industries and Regional Development noting that an extension of time had been provided and sought input on when feedback would be provided. | | | |
| | | 685 | 5/09/2025 10:36 | Email | | Received | Department of Primary Industries and Regional Development (DPIRD) sent an email to Santos and advised it considered itself a relevant person in relation to the proposed activities o fthis environment plan.<br><br>DPIRD provided general advice in relation to the considerations for inclusion into the development of the environmental plan. These topics included:<br>1) fishing interests in the area;<br>2) Consultation;<br>3) Spill contingency plans;<br>4) Biosecurity;<br>5) Threatened and migratory species;<br>6) Expectation and implementation; and<br>7) Future consultation requests.<br>Refer ID 687-693 for further detail on DPIRD's feedback. | Santos notes DPIRD's general advice and have informed the department the appropriate sections of the environment plan to address the topics raised in their email.<br><br>Santos' assessment of merits for each comment made by Department of Primary Industries and Regional Development's are listed below. | Refer ID686 | |
| | | 686 | 5/09/2025 15:56 | Email | | Sent | Santos sent an email to Department of Primary Industries and Regional Development - Fisheries in response to their comments raised regarding:<br><br>1) Fishing interests in the area;<br>2) Consultation;<br>3) Spill contingency plans;<br>4) Biosecurity;<br>5) Threatened and migratory species;<br>6) Expectation and implementation; and<br>7) Future consultation requests. | Santos' assessment of merits for each comment made by Department of Primary Industries and Regional Development are listed below.<br><br>Santos considers each request from DPIRD does not raise an objection or claim about the adverse impacts of each activity to which the EP relates.<br>As such, Santos considers s25 consultation requirements to have been met. | Refer ID687 - 693 | |
| | | 687 | 5/09/2025 15:56 | Email | | Sent | DPIRD recommended that consideration be given to all commercial fisheries that may be impacted by the proposed activity. | Santos has considered the spatial overlap of commercial fisheries with Operational Areas and the EMBA and has consulted two WA managed fisheries that have had historical activity in the Operational Areas based on DPIRD FishCube data, and as such where there is potential for interaction.<br><br>Santos considers the request from DPIRD does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | Santos' response to DPIRD is set out in the assessment of merits column. No further response required. | Commercial fisheries are described in Section 3.X |
| | | 688 | 5/09/2025 15:56 | Email | | Sent | DPIRD recommended that consultation be undertaken with WA peak fishing sector bodies and Traditional Owners in order to mitigate and minimise impacts on areas actively fished, as well as any potential impacts to important recruitment and nursery areas that are vital to ensure the long-term sustainability of fish resources. | Santos has provided sufficient information by way of a dedicated fact sheet to engage those fisheries where there is potential for potential interaction, as well as indicate those fisheries that could be impacted in the unlikely event of a spill.<br><br>In addition:<br>a) Santos has consulted First Nations organisations in WA who may have interests in or proximal to the EMBA; and<br>b) Santos has consulted the following for this EP - WA Fishing Industry Council, Recfishwest, Marine Tourism WA and Aquaculture Association of WA.<br><br>Santos considers the request from DPIRD does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | Santos' response to DPIRD is set out in the assessment of merits column. No further response required. | General and commercial fishing fact sheets are included in Appendix XX. |
| | | 689 | 5/09/2025 15:56 | Email | | Sent | DPIRD requests in the incident of an oil spill to be reported to Department of Transport's Maritime Environmental Emergencies within 24 hours of reporting the incident. | Santos informed DPIRD that their request to be notified in the event of a spill will be included in the environment plan.<br><br>Santos considers the request from DPIRD does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | Santos' response to DPIRD is set out in the assessment of merits column. No further response required. | Activity notifications are included in Table 8-X. |
| | | 690 | 5/09/2025 15:56 | Email | | Sent | DPIRD requested that management plans include considerations aimed at reducing the risk of pest and aquatic diseases, and requested that any suspected or confirmed presence of any marine pest or disease be reported within 24 hours by all vessel operators associated with this project. | Santos acknowledged advice about bio-security risk and confirmed that the EP would include the identification and assessment of biosecurity risk, with mitigation strategies and control measures proposed to ensure any identified impacts and risks are as low as reasonably practicable.<br><br>Santos considers the request from DPIRD does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | Santos' response to DPIRD is set out in the assessment of merits column. No further response required. | The Santos' environmental management framework relevant to biosecurity risks is outlined in Section 7.X |
| | | 691 | 5/09/2025 15:56 | Email | | Sent | DPIRD requested that threatened and/or migratory species associated with Matters of National Environmental Significance be considered in the development of the environment plan. | Santos acknowledged request about Matters of National Environmental Significance and confirmed that the EP would include the identification of impacts and risks to Matters of National Environmental Significance and appropriate controls applied as required.<br><br>Santos considers the request from DPIRD does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | Santos' response to DPIRD is set out in the assessment of merits column. No further response required. | Matters of National Environmental Significance are described in Section 3.X. |
| | | 692 | 5/09/2025 15:56 | Email | | Sent | DPIRD requested that all potential impacts to fisheries, fish resources and the aquatic environment are acknowledged in the environment plan including strategies to mitigate or minimise these impacts. | Santos acknowledged the request from Department of Primary Industries and Regional Development that all potential impacts to fisheries, fish resources and the aquatic environment are addressed in the Environment Plan, in association with defined strategies to mitigate or minimise the impacts.<br><br>Santos considers the request from DPIRD does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | Santos' response to DPIRD is set out in the assessment of merits column. No further response required. | Impacts to fisheries, fish resources and the aquatic environment are described in Sections ^.X and 7.X. |
| | | 693 | 5/09/2025 15:56 | Email | | Sent | DPIRD recommended that in addition to the general project information that a fisheries summary be provided. | Santos acknowledged the request from Department of Primary Industries and Regional Development for future consultation to include a fisheries summary in addition to general project information.<br><br>Santos considers the request from DPIRD does not raise an objection or claim about the adverse impacts of each activity to which the EP relates.<br>As such, Santos considers s25 consultation requirements to have been met. | Santos' response to DPIRD is set out in the assessment of merits column. No further response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Department of Transport - Marine pollution** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 474 | 23/07/2025 12:04 | Email | | Received | Department of Transport - Marine Pollution sent an auto-generated email to Santos acknowledging receipt of the campaign email. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Department of Water and Environmental Section** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Gascoyne Development Commission** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Ningaloo Coast World Heritage Advisory Committee** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Pilbara Development Commission** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 Department or Agency:Department or agency of Western Australia | **Pilbara Ports Authority** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Regional Development Australia - Mid West Gascoyne** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Regional Development Australia - Pilbara** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 01 Department or Agency:Department or agency of Western Australia | **Shark Bay World Heritage Advisory Committee** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 01 Department or Agency:Department or agency of Western Australia | **Western Australian Museum** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 02 Academic Organisation | **Curtin University (Centre for Marine Science and Technology)** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 02 Academic Organisation | **Edith Cowan University** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 02 Academic Organisation | **James Cook University** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 02 Academic Organisation | **Murdoch University** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 02 Academic Organisation | **University of Western Australia Oceans Institute** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 03 Research Organisation | **Centre for Whale Research** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 03 Research Organisation | **Commonwealth Scientific and Industrial Research Organisation- CSIRO's Indian Ocean Marine Research Centre WA** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 03 Research Organisation | **Dampier Archipelago Environmental Advisory Group** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 478 | 23/07/2025 12:10 | Email | | Received | Department of Biodiversity, Conservation and Attractions sent an auto-generated email to Santos indicating that Santos email will be forwarded to the relevant area of the department for direct response. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 03 Research Organisation | **Minderoo Foundation Exmouth Research Lab** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 03 Research Organisation | **Shark Bay Dolphin Project** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 03 Research Organisation | **The Pew Charitable Trusts** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 03 Research Organisation | **The Shark Ark Project** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 573 | 19/08/2025 09:22 | Phone call | | Sent | Santos called mobile number to follow up on consultation closing date for Bedout Multi-well Exploration and Drilling Appraisal Environment Plan - number has been disconnected. No other number for contact. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 03 Research Organisation | **Western Australian Marine Science Institution** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 04 Commercial Fishing:Western Australia (licence holder) | **Licence holder in the Mackerel Managed Fishery** | 580 | 24/07/2025 10:35 | Phone call | | Sent | Santos called the licence holder in the Mackerel Managed Fishery to advise that consultation material would be provided to licence holders in the Mackerel Managed Fishery under Santos' fee-for-service arrangements with the Western Australian Fishing Industry Council. The licence holder advised that marine seismic activities were of more interest than drilling activities, but appreciated the courtesy call. | | | |
| | | 717 | 6/08/2025 18:30 | Email | | Received | Licence holder in the Mackerel Managed Fishery sent an email to Santos expressing interest in the appraisal drilling works in Bedout Basin. | Santos notes that mackerel licence holder had not raised any objections/claims with this email. | No response required. | Not applicable. |
| | | 607 | 14/08/2025 13:00 | Email | | Sent | Santos sent a follow up email to a mackerel fish licence holder to offer to engage on consultation of this environment plan either in person with Santos associates in Port Hedland or via a phone call. | | | |
| | | 678 | 14/08/2025 16:08 | Email | | Sent | Santos offered to meet with mackerel licence holder on Bedout Multi-well Exploration and Appraisal Drilling Environment Plan consultation. | | | |
| | | 565 | 18/08/2025 15:21 | Phone call | | Sent | Santos called the licence holder and left a voicemail to confirm receipt the licence holder's email to the Santos Consultation Mailbox regarding his interest in Bedout Multi-well Exploration and Appraisal Drilling Program Environment Plan. The message also included an opportunity to meet and a Santos contact number was provided. | | | |
| | | 695 | 5/09/2025 15:36 | Email | | Sent | Santos sent an email to mackerel licence holder sharing information on management of impacts to commercial fishers operating in waters north of Port Hedland and proximal to Santos' proposed activities. | | | |
| | | 704 | 9/09/2025 00:00 | Phone call | | Received | Mackerel licence holder called Santos back to confirm receipt of emails and information provided for this environment plan. No further comments or questions from licence holder. | Santos notes that mackerel licence holder had no comments or objections in relation to proposed activities.<br>Santos considers Section 25 consultation requirements to have been met. | As a precautionary measure Santos will provide an activity notification to mackerel fishery licence holders prior to the start and upon completion of activities.<br>This activity notification is in addition to Notice to Mariners as provided by the Australian Hydrographic Office. | Activity notifications are included in Table 8-X. |
| 04 Commercial Fishing:Western Australia (licence holder) | **Western Australian Fishing Industry Council (in its distribution capacity under fee for service arrangements)** | 483 | 23/07/2025 15:05 | Email | | Sent | Santos sent an email to Western Australian Fishing Industry Council to inform start of Bedout Basin consultation and request for assistance under fee-for-service arrangements provide Santos' consultation materials to licence holders in the Mackerel Managed Fishery (Area 2) and the Pilbara Trawl Interim Managed Fishery. | | | |
| | | 487 | 25/07/2025 11:45 | Email | | Received | Western Australian Fishing Industry Council sent an email to Santos confirming the licence holders to be consulted for this environment plan consultation are Mackerel Managed Fishery and the Pilbara Fish Trawl Interim Managed Fishery. | | | |
| | | 488 | 25/07/2025 14:30 | Email | | Received | Western Australian Fishing Industry Council sent an email to Santos sharing email that was sent to Pilbara Fish Trawl and Mackerel (Area 2) on this environment plan consultation. Further, Western Australian Fishing Industry Council informed that feedback would be provided by 25 August 2025. | | | |
| | | 633 | 25/08/2025 16:10 | Email | | Received | Santos received an email from WAFIC informing a mackerel licence holder had concerns about the proposed drilling progam, given historic concerns with respect to marine seismic survey. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 694 | 5/09/2025 15:12 | Email | | Sent | Santos sent an email to Western Australian Fishing Industry Council to close out concerns raised by a mackerel licence holder about the proposed drilling program. These concerns related to potential impacts to commercial fishing from drilling activities and a demonstration that impacts are acceptable and ALARP. | Santos notes the feedback from the licence holder, which was provided via the Western Australian Fishing Industry Council.<br>Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | Santos anticipates potential impacts to fishers to be limited to operational inconveniences, such as brief displacement from fishing grounds. This displacement is to be confined to the Operational Areas and exclusion zones, and will only last for the short duration of the activities.<br>- An activity notification will be provided to mackerel fisher licence holders prior to the start and upon completion of activities.<br>- Maritime notices will be issued via the AHO to inform all marine users of the location and nature of the activity, reducing the likelihood of unintentional interaction.<br>- A 500 m Petroleum Safety Zone (PSZ) exclusion zone around the MODU will be established to isolate the activity and minimise the risk of vessel collisions, with support vessels also present to assist in the visual identification of third-party vessels.<br>- No fishing will be permitted from the MODU or support vessels to minimise potential interaction with fisheries.<br>- The area that will be temporarily unavailable due to the exclusion zone is small compared to the available marine area, including commercial fishing zones | Impacts to commercial fisheries are described in Section 6.X.<br>Risks to commerial fisheries are described in Section 6.X.<br>Activity notifications are included at Table 8-X. |
| 05 Energy Industry:Greenhouse Gas licence holder | **DeepCstore** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Greenhouse Gas licence holder | **InCapture P/L** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 484 | 24/07/2025 10:50 | Email | | Received | InCapture sent an email to Santos to acknowledge receipt of campaign email and commented that they do not expect to be impacted by these activities and have no objections. | Santos notes the feedback from inCapture that it did not expect to be impacted by proposed activities and had no onbejctions.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Greenhouse Gas licence holder;05 Energy Industry:Petroleum titleholder | **Chevron Australia** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 520 | 5/08/2025 08:45 | Email | | Received | Chevron Australia sent an email to Santos and advised it had no concerns on the planned activities. Chevron also advised of its updated consultation contact details. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 631 | 22/08/2025 17:00 | Email | | Received | Santos received an email from Chevron on consultation of this environment plan. Chevron communicated that the organisation does not have any issues or objections to this environment plan. | Santos notes the feedback from Chevron that it did not have any issues or obejctions about proposed activities.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Greenhouse Gas licence holder;05 Energy Industry:Petroleum titleholder | **Woodside Energy Group Ltd** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **3D Energi** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map;Fisher Factsheet | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **Beagle No.1 Pty Ltd** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map;Fisher Factsheet | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with links to a general fact sheet and commercial fisher fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **BP Developments Australia** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **Finder Energy Holdings Ltd** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 05 Energy Industry:Petroleum titleholder | **INPEX** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 477 | 23/07/2025 12:10 | Email | | Received | Inpex sent an auto-generated out of office email to Santos advising the recipient was travelling for work and there would be a delay in response. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **Jadestone Energy (Australia) Pty Ltd** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **KATO Energy** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **KUFPEC Australia Pty Ltd** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 05 Energy Industry:Petroleum titleholder | **Melbana Energy Ltd** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **Pathfinder Energy Pty Ltd** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **Vermilion Oil & Gas** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 05 Energy Industry:Petroleum titleholder | **Western Gas Pty Ltd** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 06 Environmental (non-Government) conservation organisation | **Australian Conservation Foundation** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 588 | 5/08/2025 16:05 | Reminder Email | | Sent | Santos sent a courtesy email to Australian Conservation Foundation to inform consultation for this EP closes 22 August 2025. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 616 | 20/08/2025 14:40 | Reminder Email | | Sent | Santos sent a final reminder email to Australian Conservation Foundation of closing date for consultation of this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 06 Environmental (non-Government) conservation organisation | **Australian Marine Conservation Society** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 590 | 5/08/2025 16:05 | Email | | Sent | Santos sent a courtesy email to inform Australian Marine Conservation Society that consultation for this environment plan is currently open until Friday, 22 August 2025. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 617 | 20/08/2025 14:40 | Email | | Sent | Santos sent a reminder email to Australian Marine Conservation Society of consultation closing date for this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| | | 1887 | 8/01/2026 | Public comment | Submission | Received | Australian Marine Conservation Society made a submission during the NOPSEMA public comment period for this EP. The submission related to:<br>1) Underwater noise<br>2) Oil spills | Comments received from the Australian Marine Conservation Society via a submission have been assessed through the Public Comment Report for this EP. The submission does not raise any additional impacts or risks that have not been considered and assessed in the EP.-As such, no further consultation is required, and Santos considers consultation requirements to have been met. | No response required. | Section 6.4 - Noise<br>Section 7 - Impacts from unplanned events including unplanned hydrocarbon spills. |
| 06 Environmental (non-Government) conservation organisation | **Cape Conservation Group** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 591 | 5/08/2025 16:10 | Email | | Sent | Santos sent a courtesy email to Cape Conservation Group that the consultation for this environment plan is open until Friday, 22 August 2025. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 618 | 20/08/2025 14:47 | Email | | Sent | Santos sent a reminder email to Cape Conservation Group of consultation closing date of this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 06 Environmental (non-Government) conservation organisation | **Care for Hedland Environmental Association** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 592 | 5/08/2025 16:10 | Email | | Sent | Santos sent a courtesy email to inform that consultation for this EP is currently open until Friday, 22 August 2025. | | | |
| | | 547 | 12/08/2025 12:01 | Phone call | | Sent | Santos phoned Care for Hedland to confirm receipt of Bedout Multi-Well Consultation material and offer to meet. A meeting was confirmed for 21 August 2025 in Port Hedland. | | | |
| | | 640 | 12/08/2025 12:20 | Phone call | | Sent | Santos phoned Care for Hedland to discuss opportunity to meet to discuss Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan. | | | |
| | | 548 | 12/08/2025 12:25 | Email | | Sent | Santos sent an email to Care for Hedland to confirm meeting on Thursday 21 August 2025 to discuss Bedout Multi-Well Exploration and Appraisal and Drilling Environment Plan. | | | |
| | | 641 | 12/08/2025 12:30 | Email | | Sent | Between 12 August 2025 and 14 August 2025 Santos and Care for Hedland exchanged emails to arrange a mutually convenient time to discuss the Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan. A meeting was confirmed for 21 August 2025. | | | |
| | | 642 | 21/08/2025 18:00 | Meeting | | Sent | Santos met with Care for Hedland to discuss the Bedout Basin Multi-well Exploration and Appraisal Drilling Environment Plan.<br><br>Care for Hedland provided feedback on the Environment Plan, consistent with feedback on previous Environment Plans, which included concerns regarding:<br>1) Noise and lighting impact on turtles;<br>2) Spill management; and<br>3) A request to receive notifications.<br>Refer ID 643 for further detail on CFHEA's feedback. | Santos notes the concerns raised by Care for Hedland listed below and have informed Care for Hedland the appropriate sections of the environment plan for inclusion of:<br>1) noise and light impacts on turtles<br>2) oil spill management<br>3) receiving notification on oil spill incidents<br><br>Santos considers the request from Care for Hedland does not raise an objection or claim about the adverse impacts of each activity to which the EP relates.<br>As such, Santos considers s25 consultation requirements to have been met. | Refer ID643 | Section 6.3 - Light<br>Section 6.4 - Noise<br>Section 7 - Impacts from unplanned events including unplanned hydrocarbon spills.<br>Table 8.4 - Activity Notifications |
| | | 643 | 25/08/2025 09:30 | Email | Presentation | Sent | Santos sent an email to Care for Hedland to address matters raised during the consultation meeting with Care for Hedland on 21 August 2025. | Santos confirmed it had considered this feedback in the development of the Bedout Basin Multi-well Exploration and Appraisal Drilling Environment Plan, which contains controls measures to address impacts to marine fauna throughout the duration of the activity.<br><br>In particular:<br>- Impacts from light is assessed within Section 6.3 and impacts from noise is assessed in Section 6.4 of the Environment Plan;<br>- Impacts from unplanned events such as vessel interaction is assessed with Section 7.3; and<br>- Potential risk and impacts from unplanned hydrocarbon spills within Sections 7.6 - 7.8 of the Environment Plan.<br><br>Care for Hedland has been added to the emergency and activity notifications list Table 8-4 of the Environment Plan. | Santos' response to CFHEA is set out in the assessment of merits column. No further response required. | Section 6.3 - Light<br>Section 6.4 - Noise<br>Section 7 - Impacts from unplanned events including unplanned hydrocarbon spills.<br>Table 8.4 - Activity Notifications |
| | | 644 | 25/08/2025 12:40 | Email | | Received | Care for Hedland sent an email to Santos confirming consultation on the Bedout Basin Multi-well Exploration and Appraisal Drilling Environment Plan is closed. | Notwithstanding the consultation information provided and the consultation effort described, no objections were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 06 Environmental (non-Government) conservation organisation | **Conservation Council of WA** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 463 | 23/07/2025 11:50 | Email | General Factsheet | Received | Conservation Council of WA sent an auto-generated email to Santos acknowledging receipt of the campaign email. | | | |
| | | 593 | 5/08/2025 16:15 | Email | | Sent | Santos sent a courtesy email to inform Conservation Council of WA that the consultation for this EP is currently open until Friday, 22 August 2025. | | | |
| | | 594 | 5/08/2025 16:15 | Email | | Received | Santos received an auto-generated reply email from Conservation Council of WA acknowledging receipt of courtesy email. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent the first email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 619 | 20/08/2025 14:50 | Email | | Sent | Santos sent a second and final reminder email to Conservation Council of WA to inform of consultation closing date of this environment plan. | As per Consultation Plan, Santos sent two reminder emails as Conservation Council of WA was deemed high risk for proposed activities to be managed under this EP. | Refer ID558 & 669. | |
| | | 628 | 20/08/2025 15:10 | Email | | Received | Santos received an auto-generated reply email from Conservation Council of WA in response to reminder email on consultation closing date of 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| | | 1888 | 8/01/2026 00:00 | Public comment | Submission | Received | NOPSEMA received comments from Conservation Council of WA via the NOPSEMA public comment period.<br>This organisation made a submission to NOPSEMA during the public comment period, in which no additional impacts or risks were raised that have not been considered in the EP.<br>This organisation also prepared a briefing note published by a public campaign called Go Beyond Gas, which is supported by four Perth-based community groups.<br>This briefing note cites potential impacts (light, noise and greenhouse emissions) and risks (spill). The briefing note also cites general opposition to fossil fuel development, which is outside the scope of assessment of merits for this EP. | Comments received from the Conservation Council of WA via a submission and briefing note have been assessed through the Public Comment Report for this EP. The submission and supporting briefing note do not raise any additional impacts or risks that have not been considered and assessed in the EP. As such, no further consultation is required, and Santos considers consultation requirements to have been met. | No response required. | Section 6.3 - Light<br>Section 6.4 - Noise<br>Section 6.5 - Atmospheric Emissions<br>Section 7 - Impacts from unplanned events including unplanned hydrocarbon spills. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 06 Environmental (non-Government) conservation organisation | **Coral Bay Progress Association** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 595 | 5/08/2025 16:15 | Email | | Sent | Santos sent a courtesy email to inform Coral Bay Progress Association that consultation for this environment plan is currently open until Friday, 22 August 2025. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 620 | 20/08/2025 14:55 | Email | | Sent | Santos sent a reminder email to Coral Bay Progress Association to inform of consultation closing date for this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 06 Environmental (non-Government) conservation organisation | **Greenpeace Australia Pacific** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 472 | 23/07/2025 11:50 | Email | | Received | Greenpeace Australia sent an auto-generated email to Santos acknowledging receipt of the campaign email. | | | |
| | | 596 | 5/08/2025 16:20 | Email | | Sent | Santos sent a courtesy email to Greenpeace Australia to inform consultation on this environment plan is currently open until Friday, 22 August 2025. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 621 | 20/08/2025 14:55 | Email | | Sent | Santos sent a reminder email to Greenpeace Australia Pacific to inform consultation closing date of this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 06 Environmental (non-Government) conservation organisation | **International Fund for Animal Welfare** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 597 | 5/08/2025 16:20 | Email | | Sent | Santos sent a courtesy email to inform International Fund for Animal Welfare that consultation on this environment plan is currently open until Friday, 22 August 2025. | | | |
| | | 604 | 5/08/2025 16:30 | Email | | Received | Santos received an auto-generated reply email from International Fund for Animal Welfare acknowledging receipt of courtesy email. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 622 | 20/08/2025 15:00 | Email | | Sent | Santos sent a reminder email to International Fund for Animal Welfare to inform consultation closing date for this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | No applicable. |
| 06 Environmental (non-Government) conservation organisation | **Protect Ningaloo** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 598 | 5/08/2025 16:20 | Email | | Sent | Santos sent a courtesy email to Protect Ningaloo to inform consultation on this environment plan is currently open until Friday 22 August 2025. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 623 | 20/08/2025 15:00 | Email | | Sent | Santos sent a reminder email to Protect Ningaloo to inform consultation closing date of this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 06 Environmental (non-Government) conservation organisation | **Sea Shepherd Australia** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 599 | 5/08/2025 16:20 | Email | | Sent | Santos sent a courtesy email to Sea Shepherd Australia to inform consultation on this environment plan is currently open until Friday, 22 August 2025. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 624 | 20/08/2025 15:00 | Email | | Sent | Santos sent a reminder email to Sea Shepherd Australia to inform of consultation closing date of this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 06 Environmental (non-Government) conservation organisation | **Whale and Dolphin Conservation** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 600 | 5/08/2025 16:25 | Email | | Sent | Santos sent a courtesy email to Whale and Dolphin Conservation Society to inform consultation on this environment plan is currently open until Friday, 22 August 2025. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 625 | 20/08/2025 15:00 | Email | | Sent | Santos sent a reminder email to Whale and Dolphin Conservation Society to inform consultation closing date of this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 06 Environmental (non-Government) conservation organisation | **Wilderness Society** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 601 | 5/08/2025 16:25 | Email | | Sent | Santos sent a courtesy email to inform Wilderness Society that consultation on this environment plan currently open until Friday, 22 August 2025. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 626 | 20/08/2025 15:05 | Email | | Sent | Santos sent a reminder email to Wilderness Society to inform of consultation closing date of this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 06 Environmental (non-Government) conservation organisation | **World Wide Fund for Nature** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 602 | 5/08/2025 16:30 | Email | | Sent | Santos sent a courtesy email to Worldwide Fund for Nature to inform consultation on this environment plan currently open until Friday, 22 August 2025. | | | |
| | | 603 | 5/08/2025 16:30 | Email | | Received | Worldwide Fund Australia sent an auto-generated reply to Santos acknowledging receipt of courtesy email. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 627 | 20/08/2025 15:05 | Email | | Sent | Santos sent a reminder email to Worldwide Fund for Nature to inform consultation closing date of this environment plan. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable |
| 07 First Nations:Aboriginal Corporations and Representative Body - Western Australia | **Murujuga Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 703 | 13/08/2025 10:40 | Email | | Received | Murujuga Aboriginal Corporation sent an email to Santos with a letter attached to inform Santos that the Murujuga Cultural Landscape has been inscribed on the UNESCO World Heritage List in July 2025. Murujuga enquired how the environment plan will address the risks and impacts to world heritage areas including consideration of environment and cultural values, and how Santos would notify Murujuga Aboriginal Corporation in the event of an environmental incident. | | | |
| | | 608 | 14/08/2025 16:10 | Email | | Sent | Santos sent a response email to Murujuga Aboriginal Corporation's letter to acknowledge and note that the Murujuga Cultural Landscape is on UNESCO World Heritage List; that Murujuga Aboriginal Corporation was to be notified in event of an environmental incident; and the environment plan addressed the risk and impacts to world heritage areas. | Santos notes feedback provided provided by the Murujuga Aboriginal Corporation.<br>Notwithstanding the consultation information provided and the consultation effort described, no objections were received on this EP.<br>Santos considers NOPSEMA s25 consultation requirements to have been met. | Santos to notify Murujuga Aboriginal Corporation in the event of an environmental incident. | Protected areas including the Murujuga Cultural Landscape are described in Section 3.X.<br>Section 7 of the EP addresses the risks and impacts to world heritage areas, which includes consideration of the environment and cultural values associated with these protected areas and applies appropriate controls.<br>Activity notifications are described in Tables 8-4 and 8-6. |
| 07 First Nations:Aboriginal Corporations and Representative Body - Northern Territory | **Northern Land Council** | 821 | 15/10/2025 12:55 | Email | General Factsheet;Map | Sent | Santos sent an email to Northern Land Territory Council to inform of Bedout Multi-well Exploration Appraisal and Drilling Program Environment Plan and asked for any feedback that the organisation may have by 14 November 2025. | | | |
| | | 866 | 22/10/2025 00:00 | Email | | Sent | Santos sent a follow up email to find out if Northern Land Council had received initial email sent on 15 October 2025. | | | |
| | | 921 | 30/10/2025 00:00 | Phone call | | Sent | Santos placed a call to the Northern Land Council office to follow up if the organisation had seen the two emails sent on consultation of this environment plan. Phone call rang out after six minutes.<br>A phone call was also placed to the Executive Assistant to CEO and the call rang out and no option to leave a voicemail. | | | |
| | | 1286 | 6/11/2025 | Reminder Email | | Sent | Santos sent a reminder email to Northern Land Council asking for feedback on this environment plan by close of business, Friday 14 November 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Native Title Representative Body - Western Australia | **Yamatji Marlpa Aboriginal Corporation** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered and Pending Native Title Claim - Western Australia | **Nhuwala Claim Group** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 460 | 28/07/2025 14:40 | Phone call | | Received | Santos received a phone call from a Nhuwala Claim Group representative to confirm that a Santos and Nhuwala meeting scheduled for 4 August 2025 could include consultation on the proposed Bedout Multi-Well Exploration and Drilling Appraisal Environment Plan. | | | |
| | | 556 | 4/08/2025 10:04 | Meeting | | Sent | Santos met with Nhuwala Claim Group on 4 August 2025 to discuss the Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan. No claims or objections in relation to proposed activities were raised during the meeting. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 555 | 6/08/2025 15:15 | Email | Presentation | Sent | Santos sent an email to Nhuwala Claim Group to follow up on meeting of 4 August 2025 to close out discussions on the Bedout Multi-well Environment and Drilling Appraisal environment plan and confirmed that no claims or objections were raised regarding the proposed activities. | Santos notes that the Nhuwala Claim Group had no claims or objections on proposed activities.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered and Pending Native Title Claim - Western Australia | **Thalanyji Nhuwala People** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Buurabalayji Thalanyji Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Gogolanygor Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Karajarri Traditional Lands Association** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Kariyarra Aboriginal Corporation** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 456 | 28/07/2025 09:42 | Phone call | | Sent | Santos phoned Kariyarra Aboriginal Corporation to confirm receipt of Bedout Multi-well Environment Plan consultation materials and discuss options to meet. Meeting scheduled for 22 August 2025. | | | |
| | | 652 | 6/08/2025 08:30 | Phone call | | Received | Santos received a phone call from Kariyarra Aboriginal Corporation to discuss arrangements for the meeting scheduled for 22 August 2025 to discuss the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 650 | 22/08/2025 10:00 | Meeting | | Sent | Santos met with Kariyarra Aboriginal Corporation to discuss the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. Kariyarra provided information on a certain island (but requested that this information remain confidential) and would like to be notified in the event of a spill that may impact their area of interest. | Santos notes that the request from Kariyarra to be notified in the event of a spill that affects their country.<br><br>Santos considers each request from Kariyarra does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | Refer ID 721 and 798 | Activity notifications are described in Table 8-X. |
| | | 664 | 27/08/2025 14:10 | Email | | Sent | Santos sent an email to Kariyarra Aboriginal Corporation to address and close out matters raised at the meeting of 22 August 2025 relevant to the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. These matters included notification in the event of a spill and identification of sites of importance to Kariyarra Aboriginal Corporation. No objections or claims were raised in consultation of this environment plan.<br>Santos addressed the matters raised by Kariyarra Aboriginal Corporation and confirmed it considered consultation with Kariyarra Aboriginal Corporation closed for this Environment Plan (Bedout Multi-well Exploration and Appraisal Drilling Environment Plan). | Santos notes that the request from Kariyarra to be notified in the event of a spill that affects their country.<br><br>Santos considers the request from Kariyarra does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. | No response required. | Activity notifications are described in Table 8-X. |
| | | 722 | 12/09/2025 00:00 | Email | | Received | Kariyarra Aboriginal Corporation sent an email to Santos sharing location of certain islands and stated that their preferred reference is for 'protection of the islands' in the environment plan. | | | |
| | | 721 | 17/09/2025 00:00 | Email | | Sent | Santos sent an email to Kariyarra Aboriginal Corporation to confirm receipt of location of the islands and to confirm Kariyarra Aboriginal Corporation are comfortable for information of islands to be made public in the environment plan. | | | |
| | | 798 | 24/09/2025 02:00 | Email | | Received | Kariyarra Aboriginal Corporation sent an email to Santos to confirm that they do not wish the certain islands that may be affected to be identified by name or metnioned in the environment plan and OPEP. However, Kariyarra would like to be notified in the event of a spill that may impact their area of interest. Kariyarra also agreed to include a copy of the islands map in the Sensitive Information Report for NOPSEMA.<br>Kariyarra acknowledged that consultation on this environment plan is complete. | Santos notes areas of importance to the Kariyarra Aboriginal Corporation.<br>Santos notes the request for DoT contact details.<br>Santos notes that the request from to be notified in the event of a spill that affects their country.<br>Santos acknowledges Kariyarra's request to not include map of islands in the environment plan or the OPEP.<br><br>Santos considers each request from Kariyarra does not raise an objection or claim about the adverse impacts of each activity to which the EP relates.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Activity notifications are described in Table 8-X. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Kimberley Land Council** | 440 | 23/07/2025 11:44 | Campaign Email | | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Kunin Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Malgana Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Nganhurra Thanardi Garrbu Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Ngarluma Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 455 | 28/07/2025 09:08 | Phone call | | Sent | Santos phoned Ngarluma Aboriginal Corporation to discuss a potential meeting on consultation of Bedout Multi-well Exploration and Drilling Appraisal Environment Plan. | | | |
| | | 552 | 8/08/2025 12:05 | Email | | Sent | Santos sent an email to Ngarluma Aboriginal Corporation by way of reminder that the consultation period for this Environment plan was closing on 22 August 2025. | | | |
| | | 553 | 8/08/2025 12:05 | Email | | Received | Ngarluma Aboriginal Corporation sent an email to Santos confirming an interest in discussing the Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan and would respond shortly with a suggested date. | | | |
| | | 645 | 8/08/2025 12:05 | Email | | Sent | Santos and Ngarluma Aboriginal Corporation exchanged emails to arrange a suitable time to meet to discuss the Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan. | | | |
| | | 646 | 12/08/2025 11:20 | Phone call | | Sent | Between 12 August 2025 and 13 August 2025 Santos and Ngarluma Aboriginal Corporation exchanged phone calls to arrange a meeting date to discuss the Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan. A meeting date was set for Monday 25 August 2025. | | | |
| | | 554 | 13/08/2025 11:20 | Phone call | | Received | Ngarluma Aboriginal Corporation phoned Santos to confirm meeting date for 25 August 2025 to discuss the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. | | | |
| | | 551 | 13/08/2025 14:20 | Email | | Sent | Santos sent an email to Ngarluma Aboriginal Corporation to confirm meeting arrangements for 25 August 2025 to discuss the Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan. | | | |
| | | 648 | 21/08/2025 13:25 | Phone call | | Sent | Santos and Ngarluma Aboriginal Corporation exchanged phone calls to discuss arrangements for the meeting scheduled on 25 August 2025 to discuss the Bedout Multi-Well Environment Plan. | | | |
| | | 647 | 25/08/2025 08:55 | Email | | Sent | Santos and Ngarluma Aboriginal Corporation exchanged emails with final arrangements for meeting scheduled for 25 August 2025. | | | |
| | | 649 | 25/08/2025 13:00 | Meeting | | Sent | Santos met with Ngarluma Aboriginal Corporation to discuss the Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan.<br>Ngarluma Aboriginal Corporation provided information on areas of sensitivity (but asked that these areas remain confidential) and raised matters with regard to being notified in the event of an oil spill, and to be kept informed of the drilling program for this environment plan. | Santos notes the request to be notified in the event of a spill that affects their country.<br>Santos notes the request to be kept informed on proposed activities.<br>Santos notes these requests and no objections or claims were raised to proposed activities at this meeting. | Refer to ID 665 | |
| | | 665 | 28/08/2025 15:50 | Email | | Sent | Santos sent an email to Ngarluma Aboriginal Corporation to address and close out matters raised at the meeting of 25 August 2025 relevant to the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. These matters included notification in the event of a spill and a request to be kept informed of the drilling program.<br>Santos addressed the matters raised by Ngarluma Aboriginal Corporation and confirmed it considered consultation with Ngarluma Aboriginal Corporation closed for this Environment Plan (Bedout Multi-well Exploration and Appraisal Drilling Environment Plan). | Santos notes the request to be notified in the event of a spill that affects their country.<br>Santos notes the request to be kept informed on proposed activities. | Santos has included Ngarluma Aboriginal Corporation for activity notifications. | Activity notifications are included in Table 8-X. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 825 | 16/10/2025 12:11 | Phone call | | Sent | Santos and Ngarluma Aboriginal Corporation exchanged phone calls to discuss Santos email of 6 October 2025 and how areas of importance to Ngarluma Aboriginal Corporation should be reflected in the Environment Plan. | | | |
| | | 826 | 16/10/2025 00:00 | Email | | Sent | Santos emailed Ngarluma Aboriginal Corporation to confirm telephone discussion of 16 October 2025 that specific areas of interest to Ngarluma not be identified in the Environment Plan and that they be notified in the event of a spill that may contact their areas of interest. | | | |
| | | 827 | 17/10/2025 00:00 | Email | | Received | Santos received an email from Ngarluma Aboriginal Corporation confirming receipt of email of 16 October 2025 and advising they would respond as soon as possible. | | | |
| | | 1243 | 4/11/2025 13:00 | Meeting | | Received | Santos met with Ngarluma Aboriginal Corporation in Karratha on 4 November 2025 to confirm how Ngarluma Aboriginal Corporation would like Santos to acknowledge areas of sensitivity to them in the Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan.<br>Ngarluma confirmed that the position outlined by Santos in correspondence of 16 October 2025 was appropriate.<br>This position is that Ngarluma Aboriginal Corporation requested they be notified in the event of a spill that may contact their area of interest. This has been included in the notifications table.<br>It was also agreed that any specific areas of interest to Ngarluma Aboriginal Corporation discussed during consultation only be reflected in the Sensitive Information Report to the regulator. | Santos notes these requests and no objections or claims were raised to proposed activities at this meeting.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | Refer ID826 | Activity notifications are included in Table 8-X. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Nyangumarta Karajarri Aboriginal Corporation** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email via Kimberley Land Council to forward to Nyangumarta Karajarri Aboriginal Corporation regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation.<br><br>Consultation Manager software showed initial email was delivered to Kimberley Land Council. | | | |
| | | 558 | 14/08/2025 11:31 | Reminder Email | | Sent | Santos sent a reminder email to Kimberley Land Council that the consultation period was closing on 22 August 2025.<br><br>Consultation Manager software showed reminder email was delivered and opened by Kimberley Land Council. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Nyangumarta Warrarn Aboriginal Corporation** | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 544 | 31/07/2025 14:50 | Email | | Received | Nyangumarta Warrarn Aboriginal Corporation sent an email to Santos to confirm receipt of consultation material for this environment plan. Nyangumarta Warrarn Aboriginal Corporation informed that the Corporation was working with Santos to develop a consultation protocol and that requests for input into environment plans would be incorporated in this protocol. | | | |
| | | 545 | 8/08/2025 12:50 | Email | | Sent | Santos sent an email to Nyangumarta Warrarn Aboriginal Corporation to advise the consultation period for this Environment Plan closes on 22 August 2025, and to ask if Nyangumarta Warrarn Aboriginal Corporation wanted to discuss the plan. | | | |
| | | 543 | 11/08/2025 13:25 | Phone call | | Sent | Santos called Nyangumarta Warrarn Aboriginal Corporation to confirm receipt of consultation materials for Bedout Multi-Well Environment Plan, discuss opportunity to meet and to inform close of consultation on 22 August 2025. Nyangumarta Warrarn confirmed it required a consultation protocol in place before any potential discussions and one would be sent shortly for Santos consideration. | Santos notes Nyangumarta Warran Aboriginal Corporation will not proceed with any discussions on consultations of environment plans with Santos until a consultation protocol is in place. | Refer to ID 719 | |
| | | 549 | 12/08/2025 13:02 | Email | | Received | Nyangumarta Warrarn Aboriginal Corporation sent an email to Santos to follow up on status of consultation protocol. | No objections or claims have been raised by the organisation in relation to this environment plan. | Refer to ID 719 | |
| | | 550 | 12/08/2025 13:07 | Email | | Sent | Santos sent an email to Nyangumarta Warrarn Aboriginal Corporation confirming Santos was waiting to receive a copy of the consultation proposal from Nyangumarta Warrarn for consideration. | No objections or claims have been raised by the organisation in relation to this environment plan. | Refer to ID 719 | |
| | | 719 | 12/08/2025 13:20 | Email | | Received | Nyangumarta Warrarn Aboriginal Corporation sent an email to Santos in reply to confirm that consultation protocol will still need to be sent to Santos for consideration. | Santos notes that there is an outstanding consultation protocol to be in place with Nyangumarta Warrarn Aboriginal Corporation, however Nyangumarta Warrarn Aboriginal Corporation have yet to provide a copy to Santos for consideration. No objections or claims have been raised by the organisation in relation to this environment plan. | No response required. | Not applicable. |
| | | 558 | 14/08/2025 11:31 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met.<br>Santos will continue to engage with Nyangumarta Warrarn Aboriginal Corporation to conclude an agreement to support future engagement and consultation on future environment plans. | No response required. | Not applicable. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Wanparta Aboriginal Corporation** | 655 | 26/06/2025 13:15 | Email | | Sent | Santos sent an email to Wanparta Aboriginal Corporation to foreshadow consultation on proposed Bedout Basin exploration activities and offer a meeting to discuss. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 657 | 18/07/2025 16:47 | Phone call | | Received | Santos received a call from Wanparta Aboriginal Corporation to discuss a potential meeting date to discuss the Bedout Mult-Well Environment Plan and advised Santos the earliest they would be able to meet would be mid-October 2025. | | | |
| | | 440 | 23/07/2025 11:44 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 656 | 1/08/2025 20:50 | Email | | Received | Between 1 July 2025 and 8 July 2025 Santos and Wanparta Aboriginal Corporation exchanged emails to identify an opportunity to meet to discuss the Bedout Basin Multi-Well Environment Plan. | | | |
| | | 658 | 5/08/2025 12:10 | Email | | Received | Wanparta Aboriginal Corporation sent an email to Santos acknowledging a planned consultation meeting scheduled for 14 October 2025 is outside the feedback period for the Bedout Basin Multi-well exploration and appraisal drilling environment plan.<br>Wanparta requested details on the next steps for Wanparta's feedback on this environment plan. | | | |
| | | 659 | 6/08/2025 07:30 | Email | | Sent | Santos sent an email to Wanparta Aboriginal Corporation to seek to meet to discuss next steps for feedack on the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. | | | |
| | | 660 | 11/08/2025 15:31 | Phone call | | Sent | Santos phoned Wanparta Aboriginal Corporation and left a message with a request to discuss the Bedout Multi-well Exploration and Appraisal Drilling Environment Plan. | | | |
| | | 661 | 25/08/2025 09:45 | Email | | Sent | Santos sent an email to Wanparta Aboriginal Corporation seeking confirmation that its feedback from a meeting in October 2024 (which it attached to its email) in relation to the previous Bedout Multi-well Environment Plan remained valid for the submission of the current Bedout Multi-well Exploration and Appraisal Drilling Environment Plan.<br>Santos confirmed it has considered this previous feedback in the development of the Environment Plan, which contains controls measures associated with the protection and management of underwater cultural heritage.<br>Santos requested feedback by 29 August 2025 if the proposed approach is acceptable. | | | |
| | | 662 | 27/08/2025 11:25 | Email | | Received | Wanparta Aboriginal Corporation sent an email to Santos referring to Santos' email dated 25 August 2025 and advised the Corporation would respond by close of business on 29 August 2025 in relation to the consultation of this environment plan. | | | |
| | | 666 | 29/08/2025 14:55 | Email | | Received | Wanparta Aboriginal Corporation sent an email to Santos to confirm that Wanparta's feedback from the consultation meeting held on 16 October 2024 remains valid for the consultation of this environment plan.<br>Feedback at the 16 October meeting reinforced the need for Santos to have management measures in placed for the protection of Underwater Cultural Heritage. | Santos notes previous feedback provided by Wanparta Aboriginal Corporation regarding management measures to be in place for the protection of Underwater Cultural Heritage. No further claims or objections were raised in relation to this environement plan.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Santos Unexpected Finds Protocol is described in Section X.X |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Wirrawandi Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 526 | 29/07/2025 10:59 | Email | | Received | Wirrawandi Aboriginal Corporation sent an email to Santos requesting a map of the proposed activity in relation to its Native Title Determined Area and requested to be consulted. | | | |
| | | 527 | 5/08/2025 15:39 | Email | | Sent | Santos sent an email to Wirrawandi Aboriginal Corporation looking forward to progress arrangements to discuss the Bedout Multi-well Exploration Environment Plan. | | | |
| | | 546 | 8/08/2025 12:05 | Email | | Sent | Santos sent an email to Wirrawandi Aboriginal Corporation by way of reminder that the consultation period for this Environment Plan was closing on 22 August 2025, and did they wish to meet to discuss. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Yawuru Native Title Holders Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 07 First Nations:Registered Native Title Bodies Corporate - Western Australia | **Yinggarda Aboriginal Corporation** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Commercial fishing | **Aquaculture Council of Western Australia** | 441 | 23/07/2025 11:56 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 559 | 14/08/2025 11:34 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Commercial fishing | **Australian Southern Bluefin Tuna Industry Association** | 444 | 23/07/2025 12:19 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet and commercial fisher fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 561 | 14/08/2025 11:43 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 08 Industry Association:Commercial fishing | **Commonwealth Fisheries Association** | 444 | 23/07/2025 12:19 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet and commercial fisher fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 561 | 14/08/2025 11:43 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Commercial fishing | **Pearl Producers Association** | 566 | 18/08/2025 15:43 | Phone call | | Sent | Santos called 1300 888 080 number and was informed number disconnected. | | | |
| | | 568 | 18/08/2025 15:44 | Phone call | | Sent | Santos found an alternative number on internet for Pearl Producers Association - rang number and was informed number no longer connected. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Commercial fishing | **Tuna Australia-Western Tuna and Billfish Fishery** | 444 | 23/07/2025 12:19 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet and commercial fisher fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 561 | 14/08/2025 11:43 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Commercial fishing | **Western Australian Fishing Industry Council** | 441 | 23/07/2025 11:56 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with links to the general fact sheet and commercial fisher fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 483 | 23/07/2025 15:05 | Email | | Received | Santos sent an email to Western Australian Fishing Industry Council to inform start of Bedout Basin consultation and request for assistance to inform licence holders of consultation. | | Refer ID 487 and 488 | |
| | | 485 | 24/07/2025 14:50 | Email | | Received | Western Australian Fishing Industry Council sent an email to Santos suggesting changes to the fisheries proposed for this environment plan consultation. | | Refer ID 487 and 488 | |
| | | 486 | 25/07/2025 10:50 | Email | | Sent | Santos emailed back to Western Australian Fishing Industry Council clarifying the required licence holders to be contacted and informed for this environment plan consultation. | | Refer ID 487 and 488 | |
| | | 487 | 25/07/2025 11:45 | Email | | Received | Western Australian Fishing Industry Council sent an email to Santos confirming the licence holders to be consulted for this environment plan consultation are Mackerel Managed Fishery and the Pilbara Fish Trawl Interim Managed Fishery. | Santos consulted the groups indentified through WAFIC. | Refer ID 488 | |
| | | 488 | 25/07/2025 14:30 | Email | | Received | Western Australian Fishing Industry Council sent an email to Santos sharing email that was sent to Pilbara Fish Trawl and Mackerel (Area 2) on this environment plan consultation. Further, Western Australian Fishing Industry Council informed that feedback would be provided by 25 August 2025. | Santos acknowledges WAFIC requires a few more days beyond consultation closing date to obtain feedback from licence holders. Santos provided additional time to receive WAFIC's feedback. | | |
| | | 559 | 14/08/2025 11:34 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 633 | 25/08/2025 00:00 | Email | | Received | Santos received an email from WAFIC sharing the organisation was contacted by a Mackerel licence holder who raised concerns about this environment plan.<br>Mackerel licence holder asked:<br>1) For a summary of why Santos thinks the impacts to Mackerel fishers are an acceptable level and are as ALARP; and<br>2) Whether fishers will be able to operate within a 2000 metre cautionary zone.<br>Refer ID 1287-1290 for further detail on Mackerel Licence Holder's feedback. | Santos' assessment of merits of each of comments made by the Mackerel licence holder are listed below. | Refer ID 950 | Not required. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 586 | 26/08/2025 13:00 | Meeting | | Sent | An engagement meeting was held between Santos and Western Australian Fishing Industry Council.<br>WAFIC representative informed of new CEO and change in team structure.<br>Engagement meeting was to learn further about the Council and its priorities.<br>WAFIC representative has agreed to setup quarterly meetings to ensure upcoming and current consultations are informed and to assist with their workload.<br>WAFIC communicated that they would be happy to assist in engaging with a mackerel licence holder on Bedout Multi-well Exploration and Appraisal Drilling Environment Plan for any further comment.<br>Santos gave a heads up that they will be working with AMSA on temporarily deviating shipping fairways in the Curie Operational Area and other future operational areas with drilling locations that are positioned in shipping fairways.<br>WAFIC would like to be kept updated on any actions and communications. Santos advised that the communication will likely come from AMSA. | Santos considers feedback from WAFIC does not raise an objection or claim about the adverse impacts of each activity to which the EP relates, and continued to engage with WAFIC on feedback from mackrel license holder. | No response required. | Not applicable. |
| | | 950 | 5/09/2025 15:05 | Email | | Sent | Santos sent an email back to WAFIC to address concerns from Mackerel Licence holder on impacts from drilling activities, summary of how impacts from this activity are an acceptable level and are ALARP, what will be put in place by Santos in the event of an unplanned event, and operation withing a 2000m cautionary zone. | Santos' assessment of merits for each comment made by Mackerel Licence Holder are listed below.<br><br>Santos considers each comment from Mackerel Licence Holder does not raise an objection or claim about the adverse impacts of each activity to which the EP relates. As such, Santos considers s25 consultation requirements to have been met. | Refer ID1287-1290 | Not required. |
| | | 1287 | 5/09/2025 15:05 | Email | | Sent | Mackerel Licence Holder commented it had concerns about further impacts that drilling activities may have on the viability of their operations. | Santos informed that potential impacts to fishers will be limited to operational inconveniences such as brief displacement from fishing grounds, and will be confined to Operational Areas and exclusion zones and only last for the short duration of the activities.<br><br>Santos has acknowledged that activitiy notifications will be provided four weeks prior to start of activities. | Santos' response to WAFIC is set out in the assessment of merits column. No further response required.<br><br>Refer ID950 | Activity notifications are included in Table 8-X. |
| | | 1288 | 5/09/2025 15:05 | Email | | Sent | Mackerel Licence Holder asked for a summary of why Santos think impacts to Mackerel fishers are an acceptable level and are as ALARP. | Santos informed that an activity notification will be provided to mackerel fisher licence holders prior to the start and upon completion of activities. A 500 m Petroleum Safety Zone (PSZ) exclusion zone around the MODU will be established to isolate the activity and minimise the risk of vessel collisions, with support vessels also present to assist in the visual identification of third-party vessels. No fishing will be permitted from the MODU or support vessels to minimise potential interaction with fisheries.<br><br>Santos has acknowledged that activitiy notifications will be provided four weeks prior to start of activities to WAFIC. | Santos' response to WAFIC is set out in the assessment of merits column. No further response required.<br><br>Refer ID950 | Activity notifications are included in Table 8-X. |
| | | 1289 | 5/09/2025 15:05 | Email | | Sent | Mackerel Licence Holder wanted to understand what Santos will have in place in the event of an unplanned event. | Santos informed that in the event of an unplanned event, Santos will include WAFIC as contact within the Oil spill response planning documents to ensure contact is made within 24 hours of the event notification, and will work closely with WAFIC on any notifications.<br><br>Santos has acknowledged that it will follow WAFIC's position regarding consultation with WA fishing industry for unplanned events. | Santos' response to WAFIC is set out in the assessment of merits column. No further response required.<br><br>Refer ID950 | Activity notifications are included in Table 8-X. |
| | | 1290 | 5/09/2025 15:05 | Email | | Sent | Mackerel Licence Holder asked Santos to confirm whether fishers will be able to operate within a 2,000m of cautionary zone. | Santos confirmed that fishers will be able to operate within the 2,000m cautionary zone, with caution. Noting that the 2,000m cautionary zone will only apply during anchor handling operations (3-5 days) either side of rig arrival and departure.<br>The only area of exclusion is a 500 m radius Petroleum Safety Zone (PSZ) exclusion zone will be in place around the MODU for the duration of the activity. The exclusion zone prevents vessels from getting too close and causing damage to equipment of either party.<br><br>Santos has acknowledged that activity notifications will be provided four weeks prior to start of activities to WAFIC. | Santos' response to WAFIC is set out in the assessment of merits column. No further response required.<br><br>Refer ID950 | Activity notifications are included in Table 8-X. |
| | | 708 | 12/09/2025 00:00 | Email | | Received | WAFIC emailed Santos to inform that its responses were provided to the Mackerel licence holder. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | Santos' response to WAFIC is set out in the assessment of merits column. No further response required. | Not required. |
| 08 Industry Association:Commercial fishing | **Western Rock Lobster Council** | 441 | 23/07/2025 11:56 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 559 | 14/08/2025 11:34 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Commercial shipping | **Maritime Industry Australia Ltd** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Energy Industry | **Australian Energy Producers** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Local government | **WA Local Government Association** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Local industry | **Carnarvon Chamber of Commerce and Industry** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Local industry | **Exmouth Chamber of Commerce and Industry** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 08 Industry Association:Local industry | **Karratha & Districts Chamber of Commerce and Industry** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Local industry | **Onslow Chamber of Commerce and Industry** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Local industry | **Port Hedland Chamber of Commerce & Industry** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Local industry | **Port Hedland Industries Council** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 08 Industry Association:Recreation and Community | **Ashburton Anglers Incorporated** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Recreation and Community | **Carnarvon Fishing Club Incorporated** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Recreation and Community | **Exmouth Community Liaison Group** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Recreation and Community | **Exmouth Game Fishing Club Inc** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 08 Industry Association:Recreation and Community | **King Bay Game Fishing Club Inc** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Recreation and Community | **Nickol Bay Sportfishing Club Inc** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Recreation and Community | **Port Hedland Game Fishing Club Inc** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Recreational fishing | **Recfishwest** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 479 | 23/07/2025 12:10 | Email | | Received | Recfishwest sent an auto-generated email advising Santos the recipient was away on leave. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 629 | 20/08/2025 16:45 | Email | | Received | Santos received a reply email from Recfishwest in response to the reminder email on consultation of this environment plan. Recfishwest did not have any objections to the activities within the operational areas but requested to be kept informed as activities progress. | Santos notes the feedback from Recfishwest that it did not have any obejctions about proposed activities and asked to be kept informed about proposed activities.<br>Santos considers Section 25 consultation requirements to have been met. | In line with current standing arrangements, Santos will notify Recfishwest four weeks prior to the start of activities and upon activity complation. | Activity notifications are included in Table 8-X. |
| 08 Industry Association:Recreational fishing | **Recreational Boater** | 682 | 5/08/2025 11:50 | Email | | Received | Santos received an enquiry via a Facebook advert on consultation of this environment plan. Contact details were provided. | | | |
| | | 684 | 6/08/2025 10:05 | Phione Call | | Sent | Santos called mobile number and left a voicemail for recreational boater to offer to contact Santos regarding this environment plan. | | | |
| | | 681 | 6/08/2025 14:15 | Email | | Sent | Santos sent an email to recreational boater after leaving a voicemail on the mobile number provided to try to engage for consultation on this environment plan. A link to the General Fact Sheet was provided. | | | |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Recreational fishing | **Western Australian Game Fishing Association** | 720 | 17/09/2025 14:12 | Campaign Email | General Factsheet; Fisher Factsheet; Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that Santos had missed this stakeholder in its initial campaign, however would still like to receive any feedback the stakeholder may have by close of business, Wednesday 24 September 2025.<br>The initial campaign email and links to both general and commercial fisher fact sheets were provided to the stakeholder for reference.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 725 | 19/09/2025 09:37 | Campaign Email | General Factsheet; Fisher Factsheet; Map | Sent | Santos sent an email to Western Australian Game Fishing Association to inform that feedback can be provided by 17 October instead of 22 September 2025. | | | |
| | | 759 | 10/10/2025 08:25 | Reminder Email | General Factsheet; Fisher Factsheet; Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 17 October 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Tourism | **Australian Tourism Industry Council** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Tourism | **Marine Tourism Western Australia** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 08 Industry Association:Tourism | **Tourism Council of Western Australia** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 08 Industry Association:Tourism | **Western Australian Indigenous Tourism Operators Council** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 10 Telecommunications Infrastructure Organisation | **Telstra** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 10 Telecommunications Infrastructure Organisation | **Vocus Group Ltd** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 12 Local Government Authorities:Western Australia | **City of Karratha** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 Local Government Authorities:Western Australia | **Shire of Ashburton** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 12 Local Government Authorities:Western Australia | **Shire of Carnarvon** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 12 Local Government Authorities:Western Australia | **Shire of East Pilbara** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 12 Local Government Authorities:Western Australia | **Shire of Exmouth** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 Local Government Authorities:Western Australia | **Shire of Shark Bay** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 12 Local Government Authorities:Western Australia | **Town of Port Hedland** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 637 | 12/08/2025 12:03 | Phone call | | Sent | Between 12 August 2025 and 13 August 2025 Santos and Town of Port Hedland exchanged phone calls to arrange to meet to discuss the Bedout Multi-Well Exploration and Drilling Appraisal Environment Plan. | | | |
| | | 557 | 13/08/2025 12:55 | Email | | Sent | Between 13 August 2025 and 14 August 2025 Santos and Town of Port Hedland exchanged emails to arrange to meet to discuss the Bedout Multi-Well Exploration and Appraisal Drilling Environment Plan. A meeting was agreed for 18 August 2025. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | | | |
| | | 638 | 15/08/2025 10:00 | Email | General Factsheet | Sent | Santos and Town of Port Hedland exchanged emails to confirm meeting arrangement for Monday 18 August 2025. | | | |
| | | 639 | 18/08/2025 12:01 | Meeting | | Sent | Santos and Town of Port Hedland met to discuss the Bedout Basin Muli-well Exploration and Appraisal Drilling Environment Plan. The Town of Port Hedland had no specific feedback on this Environment Plan. | | | |
| | | 636 | 25/08/2025 08:10 | Email | | Sent | Santos sent an email to Town of Port Hedland confirming outcomes of meeting of 18 August 2025, noting the Town of Port Hedland had no specific feedback on this Environment Plan. | Santos notes the feedback from Town of Port Hedland that it had no specific feedback about proposed activities.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **All the Gear No Idea Sportfishing** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Apache Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Aqualand Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Archipelago Adventures** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Baiyungu Dreaming** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Blue Horizon Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Blue Juice Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Coral Bay Ecotours** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Coral Coast Tours** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Dampier Archipelago and Murujuga Sea Kayak Expedition** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Dive Ningaloo** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Eighty Mile Beach Caravan Park WA** | 443 | 23/07/2025 12:04 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 560 | 14/08/2025 11:39 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Evolution Fishing Charters Exmouth** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Exmouth Adventure Co** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Exmouth Dive & Whalesharks Ningaloo** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Exmouth Fishing Adventures** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **GT Diving A** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **InnKeeper Sport Fishing Charter** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also communicated an upcoming consultation on a second environmental plan with additional operational areas in the Bedout Basin in the near future, and asked for any initial feedback on these additional operational areas during this consultation. Additionally communicated that further details and information would be provided in due course. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Karratha Adventure Sports** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Kings Ningaloo Reef tours** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Lethal Adventures** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Live Ningaloo** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Maccy Dave's Kayak Fishing Adventures** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Mackerel Islands Pty Ltd** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Mahi Mahi Fishing Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Montebello Island Safaris** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Murujuga Rock Art & Cultural Tours Pilbara WA** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| 13 Tourism Organisation | **Murujuga Aboriginal Corporation** | 703 | 13/08/2025 00:00 | Email | | Received | Santos received an email and letter from Murujuga Aboriginal Corporation that includes Murujuga Rock Art & Cultural Tours Pilbara WA.<br><br>Murujuga Aboriginal Corporation sent an email to Santos with a letter attached to inform Santos that the Murujuga Cultural Landscape has been inscribed on the UNESCO World Heritage List in July 2025. Murujuga enquired how the environment plan will address the risks and impacts to world heritage areas including consideration of environment and cultural values, and how Santos would notify Murujuga Aboriginal Corporation in the event of an environmental incident. | | | |
| | | 608 | 14/08/2025 00:00 | Email | | Sent | Santos sent a response email to Murujuga Aboriginal Corporation's letter to acknowledge and note that the Murujuga Cultural Landscape is on UNESCO World Heritage List; that Murujuga Aboriginal Corporation was to be notified in event of an environmental incident; and the environment plan addressed the risk and impacts to world heritage areas. | Notwithstanding the consultation information provided and the consultation effort described, no objections were received on this EP.<br>Santos considers NOPSEMA consultation requirements to have been met. | Santos notes feedback provided provided by the Murujuga Aboriginal Corporation. | Protected areas including the Murujuga Cultural Landscape are described in Section 3.X. Activity notifications re described in Table 8-X. |
| 13 Tourism Organisation | **Ngurrangga Tours** | 446 | 23/07/2025 12:29 | Campaign Email | | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation.<br>Email bounced. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025.<br>Email dropped. | | | |
| | | 574 | 19/08/2025 09:23 | Phone call | | Sent | Santos called both contact numbers - landline and mobile - to follow up on consultation of Bedout Multi-well Exploration and Drilling Program. Both numbers are disconnected. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Ningaloo Car & Boat Hire** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Ningaloo Coral Bay Boats** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Ningaloo Marine Interaction** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Ningaloo Reef Dive** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Ningaloo Safari Tours** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Ningaloo Sportfishing Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Ningaloo Whale Shark N Dive** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Ningaloo Whale Sharks Exmouth** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Oceanus Sport Fishing Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **On Point Spearfishing** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **On Strike Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Onslow Beach Resort** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Pardoo Tourist Park Pardoo Station** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Peak Sportfishing Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Pelican Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Pilbara Dive and Tours** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Pilbara Tours** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Reef Seeker Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Reel Teaser Fishing Adventures** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Sail Ningaloo** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Sal Salis** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 481 | 23/07/2025 12:35 | Email | | Received | Sal Salis Ningaloo Reef sent an auto-generated email to Santos acknowledging receipt of the campaign email. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Seaforce Fishing Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Seastar Boat Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Shark Bay Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Shark Bay Coastal Tours** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **Shark Bay Eco Tours** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

| Stakeholder Group | Organisation | ID | Date | Record Type | Consultation Materials (Documents/Attachments) | Sent / Received | Consultation Summary | Assessment of Merits of Objection or Claim about the Adverse Impacts of EP Activity | Santos' Response to Objection or Claim | EP Reference |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 Tourism Organisation | **Top Gun Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **View Ningaloo** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |
| 13 Tourism Organisation | **WA Fishing Charters** | 446 | 23/07/2025 12:29 | Campaign Email | General Factsheet;Map | Sent | Santos sent an email regarding consultation on the proposed activities to be managed under this EP, advising that consultation would close on 22 August 2025.<br>The email included an activity summary with a link to a general fact sheet published on the Santos' Consultation Hub website, Santos' consultation obligations under relevant Commonwealth Environmental Sections, directions on how to provide input into EP development and a link to NOPSEMA environmental approval process.<br>The linked Santos fact sheet included an overview of the proposed activities; the presence of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information; and potential impacts, risks and associated management measures.<br>The email also provided advance notification of upcoming consultation on a second drilling and appraisal environmental plan in the Bedout Basin, and asked for any initial feedback on these additional operational areas during current consultation. | | | |
| | | 562 | 14/08/2025 11:50 | Reminder Email | General Factsheet;Map | Sent | Santos sent an email by way of reminder that the consultation period was closing on 22 August 2025. | Notwithstanding the consultation information provided and the consultation effort described, no objections, no comments or input were received on this EP.<br>Santos considers it has provided sufficient information and allowed a reasonable period of time for consultation.<br>Santos considers Section 25 consultation requirements to have been met. | No response required. | Not applicable. |

# Appendix G Environmental Consequence Descriptors

# Offshore Division Environmental Hazard Identification and Assessment Guideline - Environmental Consequence Descriptors

Santos

| Consequence Level | | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|---|
| **Acceptability** | | **Acceptable** | **Acceptable** | **Unacceptable** | **Unacceptable** | **Unacceptable** | **Unacceptable** |
| **Severity Description** | | **Negligible**<br>***No impact or negligible impact.*** | **Minor**<br>***Detectable but insignificant change to local population, industry or ecosystem factors. Localised effect*** | **Moderate**<br>***Significant impact to local population, industry or ecosystem factors.*** | **Major**<br>***Major long-term effect on local population, industry or ecosystem factors.*** | **Severe**<br>***Complete loss of local population, industry or ecosystem factors AND/ OR extensive regional impacts with slow recovery.*** | **Critical**<br>***Irreversible impact to regional population, industry or ecosystem factors.*** |
| **Environmental Receptors** | **Fauna**<br>In particular, EPBC Act listed threatened/migratory fauna or WA Biodiversity Conservation Act 2016 specially protected fauna | Short term behavioural impacts only to small proportion of local population and not during critical lifecycle activity;<br>No decrease in local population size;<br>No reduction in area of occupancy of species;<br>No loss/disruption of habitat critical to survival of a species;<br>No disruption to the breeding cycle of any individual;<br>No introduction of disease likely to cause a detectable population decline. | Detectable but insignificant decrease in local population size;<br>Insignificant reduction in area of occupancy of species;<br>Insignificant loss/disruption of habitat critical to survival of a species;<br>Insignificant disruption to the breeding cycle of local population. | Significant decrease in local population size but no threat to overall population viability;<br>Significant behavioural disruption to local population;<br>Significant disruption to the breeding cycle of a local population;<br>Significant reduction in area of occupancy of species;<br>Significant loss of habitat critical to survival of a species;<br>Modify, destroy, remove, isolate or decrease availability of quality of habitat to the extent that a significant decline in local population is likely;<br>Introduce disease likely to cause a significant population decline. | Long term decrease in local population size and threat to local population viability;<br>Major disruption to the breeding cycle of local population;<br>Major reduction in area of occupancy of species;<br>Fragmentation of existing population;<br>Major loss of habitat critical to survival of a species;<br>Modify, destroy, remove, isolate or decrease availability of quality of habitat to the extent that a long term decline in local population is likely;<br>Introduce disease likely to cause a long term population decline. | Complete loss of local population;<br>Complete loss of habitat critical to survival of local population;<br>Wide spread (regional) decline in population size or habitat critical to regional population. | Complete loss of regional population;<br>Complete loss of habitat critical to survival of regional population. |
| | **Physical Environment / Habitat**<br>Includes: air quality; water quality; benthic habitat (biotic/abiotic), particularly habitats that are rare or unique; habitat that represents a Key Ecological Feature[3]; habitat within a protected area; habitats that include benthic primary producers[4] and/ or epi-fauna[5] | No or negligible reduction in physical environment / habitat area/function. | Detectable but localised and insignificant loss of area/function of physical environment / habitat. Rapid recovery evident within ~ 2 year (two season recovery) | Significant loss of area and/or function of local physical environment / habitat. Recovery over medium term (2–10 years) | Major, large-scale loss of area and/or function of physical environment / local habitat. Slow recovery over decades. | Extensive destruction of local physical environment / habitat with no recovery;<br>Long term (decades) and wide spread loss of area or function of primary producers on a regional scale. | Complete destruction of regional physical environment / habitat with no recovery.<br>Complete loss of area or function of primary producers on a regional scale. |
| | **Threatened ecological communities**<br>(EPBC Act listed ecological communities) | No decline in threatened ecological community population size, diversity or function;<br>No reduction in area of threatened ecological community;<br>No introduction of disease likely to cause decline in threatened ecological community population size, diversity or function. | Detectable but insignificant decline in threatened ecological community population size, diversity or function;<br>Insignificant reduction in area of threatened ecological community. | Significant decline in threatened ecological community population size, diversity or function;<br>Significant reduction in area of threatened ecological community;<br>Introduction of disease likely to cause significant decline in threatened ecological community population size, diversity or function. | Major, long term decline in threatened ecological community population size, diversity or function;<br>Major reduction in area of threatened ecological community;<br>Fragmentation of threatened ecological community;<br>Introduce disease likely to cause long term decline in threatened ecological community population size, diversity or function. | Extensive, long term decline in threatened ecological community population size, diversity or function;<br>Complete loss of threatened ecological community. | Complete loss of threatened ecological community with no recovery. |
| | **Protected Areas**<br>Includes: World Heritage Properties; Ramsar wetlands; Commonwealth/ National Heritage Areas; Land/ Marine Conservation Reserves. | No or negligible impact on protected area values;<br>No decline in species population within protected area;<br>No or negligible alteration, modification, obscuring or diminishing of protected area values.* | Detectable but insignificant impact on one of more of protected area's values.<br>Detectable but insignificant decline in species population within protected area.<br>Detectable but insignificant alteration, modification, obscuring or diminishing of protected area values* | Significant impact on one of more of protected area's values;<br>Significant decrease in population within protected area;<br>Significant alteration, modification, obscuring or diminishing of protected area values. | Major long term effect on one of more of protected area's values<br>Long term decrease in species population contained within protected area and threat to that population's viability<br>Major alteration, modification, obscuring or diminishing of protected area values | Extensive loss of one or more of protected area's values;<br>Extensive loss of species population contained within protected area. | Complete loss of one or more of protected area's values with no recovery;<br>Complete loss of species population contained within protected area with no recovery. |
| | **Socio-economic receptors**<br>Includes: fisheries (commercial and recreational); tourism; oil and gas; defence; commercial shipping. | No or negligible loss of value of the local industry;<br>No or negligible reduction in key natural features or populations supporting the activity. | Detectable but insignificant short-term loss of value of the local industry. Detectable but insignificant reduction in key natural features or population supporting the local activity. | Significant loss of value of the local industry;<br>Significant medium term reduction of key natural features or populations supporting the local activity. | Major long-term loss of value of the local industry and threat to viability.<br>Major reduction of key natural features or populations supporting the local activity. | Shutdown of local industry or widespread major damage to regional industry;<br>Extensive loss of key natural features or populations supporting the local industry. | Permanent shutdown of local or regional industry;<br>Permanent loss of key natural features or populations supporting the local or regional industry. |

[3] As defined by the Department of Agriculture, Water and Environment (DaWE)
[4] Benthic photosynthetic organisms such as seagrass, algae, hard corals and mangroves
[5] Fauna attached to the substrate including sponges, soft corals and crinoids.

# Appendix H Spill Modelling Results

# Appendix H1: Stochastic spill modelling results for 325 $m^3$ surface release of MDO and surface and subsea releases of Caley Crude Oil as a result of LOWC

## Ara Operational Area

### Spill modelling results for a surface release of 325 $m^3$ MDO in the Ara operational area

| Receptor | Receptor Type | Minimum Time to Contact (hrs) | | | | | | | | Maximum Hydrocarbon Concentrations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Exposure Values | | | | Moderate Exposure values | | High Exposure Values | | | | |
| | | Floating oil (1 $g/m^2$) | Shoreline accumulation (10 $g/m^2$) | Entrained hydrocarbons (1,000 ppb) | Dissolved hydrocarbons (10 ppb) | Floating oil (10 $g/m^2$) | Shoreline accumulation (100 $g/m^2$) | Floating oil (50 $g/m^2$) | Shoreline accumulation (1,000 $g/m^2$) | Shoreline accumulation ($g/m^2$) | Dissolved hydrocarbons (ppb) | Entrained hydrocarbons (ppb) |
| Clerke Reef MP | Emergent | NC | 115 | NC | NC | NC | NC | NC | NC | 20 | NC | NC |
| Imperieuse MP | Emergent | NC | 88 | NC | 72 | NC | NC | NC | NC | 13 | 17 | NC |
| Rowley Shoals surrounds | Submerged | 60 | NC | NC | 64 | NC | NC | NC | NC | NC | 24 | NC |
| State Waters-WA | Submerged | NC | NC | NC | 72 | NC | NC | NC | NC | NC | 17 | NC |

*NC = No Contact*

**Spill modelling results for a 1,017,519 $m^3$ surface release of Caley Crude as a result of a LOWC in the Ara operational area**

| Receptor | Receptor Type | Minimum Time to Contact (hrs) | | | | | | | | Maximum Hydrocarbon Concentrations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Exposure Values | | | | Moderate Exposure values | | High Exposure Values | | | | |
| | | Floating oil (1 $g/m^2$) | Shoreline accumulation (10 $g/m^2$) | Entrained hydrocarbons (1,000 ppb) | Dissolved hydrocarbons (10 ppb) | Floating oil (10 g/m2) | Shoreline accumulation (100 $g/m^2$) | Floating oil (50 $g/m^2$) | Shoreline accumulation (1,000 $g/m^2$) | Shoreline accumulation ($g/m^2$) | Dissolved hydrocarbons (ppb) | Entrained hydrocarbons (ppb) |
| Barrow-Montebello Surrounds | Intertidal | 351 | NC | NC | 309 | NC | NC | NC | NC | NC | 405 | NC |
| Barrow Island | Emergent | 1,805 | NC | NC | 806 | NC | NC | NC | NC | NC | 43 | NC |
| Bedout Island | Emergent | NC | NC | NC | 754 | NC | NC | NC | NC | NC | 19 | NC |
| Brewis Reef | Submerged | NC | NC | NC | 1,057 | NC | NC | NC | NC | NC | 11 | NC |
| Clerke Reef MP | Emergent | 61 | 94 | 70 | 64 | 107 | 115 | 259 | 139 | 13,389 | 2,777 | 11,835 |
| Dampier AMP | Submerged | 279 | NC | NC | 296 | NC | NC | NC | NC | NC | 53 | NC |
| Dampier Archipelago | Emergent | 304 | 318 | NC | 840 | NC | 341 | NC | NC | 117 | 45 | NC |
| Eighty Mile Beach AMP | Submerged | 560 | NC | NC | 716 | NC | NC | NC | NC | NC | 39 | NC |
| Gascoyne AMP | Submerged | 849 | NC | 2,277 | 944 | NC | NC | NC | NC | NC | 63 | 1,017 |
| Glomar Shoals | Submerged | 357 | NC | NC | 336 | NC | NC | NC | NC | NC | 308 | NC |
| Imperieuse Reef MP | Emergent | 64 | 77 | 70 | 69 | 100 | 113 | 111 | 121 | 13,404 | 3,743 | 11,830 |
| Kimberley AMP | Submerged | 389 | NC | NC | 428 | NC | NC | NC | NC | NC | 95 | NC |
| Lowendal Islands | Submerged | NC | NC | NC | 1,122 | NC | NC | NC | NC | NC | 12 | NC |
| Madeleine Shoals | Submerged | 354 | NC | NC | 303 | NC | NC | NC | NC | NC | 41 | NC |
| Mermaid Reef AMP | Intertidal | 84 | NC | 113 | 91 | 88 | NC | 292 | NC | NC | 1,460 | 3,008 |
| Montebello AMP | Submerged | 258 | NC | 582 | 258 | NC | NC | NC | NC | NC | 726 | 1,770 |
| Montebello Islands | Emergent | 361 | NC | NC | 323 | NC | NC | NC | NC | NC | 248 | NC |

| Receptor | Receptor Type | Minimum Time to Contact (hrs) | | | | | | | | Maximum Hydrocarbon Concentrations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Exposure Values | | | | Moderate Exposure values | | High Exposure Values | | | | |
| | | Floating oil (1 g/m$^2$) | Shoreline accumulation (10 g/m$^2$) | Entrained hydrocarbons (1,000 ppb) | Dissolved hydrocarbons (10 ppb) | Floating oil (10 g/m2) | Shoreline accumulation (100 g/m$^2$) | Floating oil (50 g/m$^2$) | Shoreline accumulation (1,000 g/m$^2$) | Shoreline accumulation (g/m$^2$) | Dissolved hydrocarbons (ppb) | Entrained hydrocarbons (ppb) |
| Muiron Islands | Emergent | 644 | 779 | NC | 651 | NC | NC | NC | NC | 55 | 33 | NC |
| Ningaloo – Offshore | Submerged | 333 | NC | 441 | 353 | NC | NC | NC | NC | NC | 632 | 2,911 |
| Ningaloo – Outer Coast North | Submerged | 625 | NC | 765 | 578 | NC | NC | NC | NC | NC | 50 | 3,349 |
| Ningaloo – Outer NW | Submerged | 658 | NC | 693 | 720 | NC | NC | NC | NC | NC | 89 | 2,792 |
| Ningaloo Coast North | Emergent | 2,207 | NC | NC | 730 | NC | NC | NC | NC | NC | 25 | NC |
| Outer Argo-Rowley Terrace AMP | Submerged | 138 | NC | 195 | 128 | 253 | NC | NC | NC | NC | 2,689 | 3,687 |
| Penguin Bank | Submerged | NC | NC | NC | 932 | NC | NC | NC | NC | NC | 12 | NC |
| Poivre Reef | Intertidal | NC | NC | NC | 2,023 | NC | NC | NC | NC | NC | 13 | NC |
| Rankin Bank | Submerged | 328 | NC | 545 | 334 | NC | NC | NC | NC | NC | 213 | 1,756 |
| Rosily Shoals | Submerged | NC | NC | NC | 717 | NC | NC | NC | NC | NC | 16 | NC |
| Rowley Shoals surrounds | Submerged | 35 | NC | 36 | 32 | 37 | NC | 52 | NC | NC | 5,660 | 13,117 |
| Scott Reef North | Emergent | NC | NC | 1,875 | NC | NC | NC | NC | NC | NC | NC | 1,008 |
| Scott Reef South | Emergent | 689 | 696 | 1,412 | NC | NC | 740 | NC | NC | 187 | NC | 2,985 |
| Southern Islands Coast | Emergent | 1,031 | 1,570 | NC | 582 | NC | NC | NC | NC | 21 | 31 | NC |
| WA State Waters | Submerged | 61 | NC | 70 | 64 | 100 | NC | 111 | NC | NC | 3,743 | 11,835 |
| Thevenard Islands | Emergent | NC | NC | NC | 956 | NC | NC | NC | NC | NC | 13 | NC |
| Western Shark Bay AMP | Submerged | NC | NC | NC | 1,818 | NC | NC | NC | NC | NC | 11 | NC |

*NC = No Contact*

## Mestrel/Bancroft Operational Area

### Spill modelling results for a surface release of 325 $m^3$ MDO in the Mestrel/Bancroft operational area

Spill modelling results for a surface release of MDO in the Mestrel/Bancroft operational area are not presented as the modelling did not predict contact with any sensitive receptor at the low thresholds for floating oil, shoreline accumulation, entrained oil or dissolved oil.

### Spill modelling results for a 1,367,291 $m^3$ surface release of Caley Crude as a result of a LOWC in the Mestrel/Bancroft operational area

| Receptor | Receptor Type | Minimum Time to Contact (hrs) | | | | | | | | Maximum Hydrocarbon Concentrations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Exposure Values | | | | Moderate Exposure values | | High Exposure Values | | | | |
| | | Floating oil (1 g/$m^2$) | Shoreline accumulation (10 g/$m^2$) | Entrained hydrocarbons (1,000 ppb) | Dissolved hydrocarbons (10 ppb) | Floating oil (10 g/m2) | Shoreline accumulation (100 g/$m^2$) | Floating oil (50 g/$m^2$) | Shoreline accumulation (1,000 g/$m^2$) | Shoreline accumulation (g/$m^2$) | Dissolved hydrocarbons (ppb) | Entrained hydrocarbons (ppb) |
| Abrolhos – Offshore NW | Submerged | NC | NC | NC | 2,330 | NC | NC | NC | NC | NC | 13 | NC |
| Barrow-Montebello Surrounds | Intertidal | 334 | NC | 367 | 336 | NC | NC | NC | NC | NC | 705 | 4,019 |
| Barrow Island | Emergent | 527 | 764 | 521 | 442 | NC | NC | NC | NC | 89 | 260 | 2,855 |
| Bedout Island | Emergent | 1,138 | 1,365 | NC | 304 | NC | NC | NC | NC | 24 | 446 | NC |
| Brewis Reef | Submerged | 971 | NC | 694 | 700 | NC | NC | NC | NC | NC | 109 | 4,762 |
| Clerke Reef MP | Emergent | NC | NC | 767 | 602 | NC | NC | NC | NC | NC | 232 | 2,712 |
| Cod Bank | Submerged | 960 | NC | NC | 422 | NC | NC | NC | NC | NC | 86 | NC |
| Dampier AMP | Submerged | 232 | NC | 220 | 211 | 423 | NC | NC | NC | NC | 1,857 | 3,400 |
| Dampier Archipelago | Emergent | 280 | 302 | 248 | 248 | 532 | 371 | NC | NC | 488 | 752 | 4,183 |
| Eighty Mile Beach AMP | Submerged | 291 | NC | 273 | 211 | NC | NC | NC | NC | NC | 823 | 3,990 |
| Exmouth Gulf Coast | Emergent | 275 | NC | 879 | 980 | NC | NC | NC | NC | NC | 39 | 1,748 |
| Exmouth Reef | Submerged | NC | NC | NC | 777 | NC | NC | NC | NC | NC | 37 | NC |
| Gascoyne AMP | Submerged | 806 | NC | 843 | 913 | NC | NC | NC | NC | NC | 99 | 5,649 |

| Receptor | Receptor Type | Minimum Time to Contact (hrs) | | | | | | | | Maximum Hydrocarbon Concentrations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Exposure Values | | | | Moderate Exposure values | | High Exposure Values | | | | |
| | | Floating oil (1 g/m$^2$) | Shoreline accumulation (10 g/m$^2$) | Entrained hydrocarbons (1,000 ppb) | Dissolved hydrocarbons (10 ppb) | Floating oil (10 g/m2) | Shoreline accumulation (100 g/m$^2$) | Floating oil (50 g/m$^2$) | Shoreline accumulation (1,000 g/m$^2$) | Shoreline accumulation (g/m$^2$) | Dissolved hydrocarbons (ppb) | Entrained hydrocarbons (ppb) |
| Glomar Shoals | Submerged | 166 | NC | 176 | 80 | NC | NC | NC | NC | NC | 2,381 | 11,773 |
| Imperieuse Reef MP | Emergent | 1,442 | NC | 486 | 459 | NC | NC | NC | NC | NC | 212 | 1,887 |
| Karratha-Port Hedland | Emergent | 364 | NC | NC | 341 | NC | NC | NC | NC | NC | 283 | NC |
| Kimberley AMP | Submerged | 717 | NC | 729 | 888 | NC | NC | NC | NC | NC | 71 | 1,783 |
| Lowendal Islands | Submerged | 486 | 677 | 483 | 459 | NC | 1,514 | NC | NC | 108 | 164 | 2,140 |
| Madeleine Shoals | Submerged | 278 | NC | 286 | 253 | NC | NC | NC | NC | NC | 889 | 3,235 |
| Mermaid Reef AMP | Intertidal | NC | NC | 781 | 800 | NC | NC | NC | NC | NC | 300 | 5,072 |
| Middle Islands Coast | Emergent | NC | NC | NC | 1,438 | NC | NC | NC | NC | NC | 12 | NC |
| Montebello AMP | Submerged | 273 | NC | 260 | 259 | 318 | NC | NC | NC | NC | 2,130 | 11,486 |
| Montebello Islands | Emergent | 342 | 353 | 501 | 350 | NC | 531 | NC | NC | 220 | 794 | 6,231 |
| Muiron Islands | Emergent | 464 | 469 | 452 | 498 | NC | 1,705 | NC | NC | 159 | 392 | 6,083 |
| Ningaloo – Offshore | Submerged | 334 | NC | 327 | 270 | 466 | NC | NC | NC | NC | 2,528 | 14,077 |
| Ningaloo – Outer Coast North | Submerged | 529 | NC | 532 | 660 | NC | NC | NC | NC | NC | 331 | 10,487 |
| Ningaloo – Outer NW | Submerged | 562 | NC | 492 | 603 | NC | NC | NC | NC | NC | 205 | 10,643 |
| Ningaloo Coast North | Emergent | 653 | 1,531 | 569 | 569 | NC | NC | NC | NC | 15 | 323 | 6,199 |
| Northern Islands Coast | Emergent | 821 | 877 | 684 | 468 | NC | NC | NC | NC | 35 | 54 | 1,322 |
| Outer Argo-Rowley Terrace AMP | Submerged | 354 | NC | 332 | 335 | NC | NC | NC | NC | NC | 1,310 | 3,147 |
| Penguin Bank | Submerged | 436 | NC | 372 | 386 | NC | NC | NC | NC | NC | 130 | 2,496 |

| Receptor | Receptor Type | Minimum Time to Contact (hrs) | | | | | | | | Maximum Hydrocarbon Concentrations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Exposure Values | | | | Moderate Exposure values | | High Exposure Values | | | | |
| | | Floating oil (1 g/m$^2$) | Shoreline accumulation (10 g/m$^2$) | Entrained hydrocarbons (1,000 ppb) | Dissolved hydrocarbons (10 ppb) | Floating oil (10 g/m2) | Shoreline accumulation (100 g/m$^2$) | Floating oil (50 g/m$^2$) | Shoreline accumulation (1,000 g/m$^2$) | Shoreline accumulation (g/m$^2$) | Dissolved hydrocarbons (ppb) | Entrained hydrocarbons (ppb) |
| Poivre Reef | Intertidal | 871 | NC | 595 | 580 | NC | NC | NC | NC | NC | 95 | 1,417 |
| Port Hedland-Eighty Mile Beach | Emergent | 1,177 | NC | NC | NC | NC | NC | NC | NC | NC | NC | NC |
| Rankin Bank | Submerged | 340 | NC | 293 | 271 | NC | NC | NC | NC | NC | 245 | 5,738 |
| Ripple Shoals | Submerged | 1,304 | NC | NC | 1,040 | NC | NC | NC | NC | NC | 35 | NC |
| Rosily Shoals | Submerged | 381 | NC | 383 | 419 | NC | NC | NC | NC | NC | 162 | 4,445 |
| Rowley Shoals surrounds | Submerged | 482 | NC | 614 | 375 | NC | NC | NC | NC | NC | 484 | 3,251 |
| Shark Bay AMP | Submerged | NC | NC | NC | 2,014 | NC | NC | NC | NC | NC | 24 | NC |
| Southern Islands Coast | Emergent | 372 | 407 | 373 | 411 | NC | 506 | NC | NC | 254 | 439 | 7,473 |
| WA State Waters | Submerged | 278 | NC | 248 | 248 | 301 | NC | NC | NC | NC | 1,159 | 7,758 |
| Sultan Reef | Submerged | NC | NC | 966 | 823 | NC | NC | NC | NC | NC | 31 | 1,309 |
| Thevenard Islands | Emergent | 604 | 1,320 | 472 | 484 | NC | NC | NC | NC | 38 | 190 | 5,919 |
| Trap Reef | Submerged | 1,238 | NC | 483 | 493 | NC | NC | NC | NC | NC | 105 | 3,040 |
| Western Shark Bay AMP | Submerged | NC | NC | NC | 1,485 | NC | NC | NC | NC | NC | 25 | NC |

*NC = No contact*

### Curie Operational Area

**Spill modelling results for a surface release of 325 $m^3$ of MDO in the Curie operational area**

| Receptor | Receptor Type | Minimum Time to Contact (hrs) | | | | | | | | Maximum Hydrocarbon Concentrations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Exposure Values | | | | Moderate Exposure values | | High Exposure Values | | | | |
| | | Floating oil (1 $g/m^2$) | Shoreline accumulation (10 $g/m^2$) | Entrained hydrocarbons (1,000 ppb) | Dissolved hydrocarbons (10 ppb) | Floating oil (10 $g/m^2$) | Shoreline accumulation (100 $g/m^2$) | Floating oil (50 $g/m^2$) | Shoreline accumulation (1,000 $g/m^2$) | Shoreline accumulation ($g/m^2$) | Dissolved hydrocarbons (ppb) | Entrained hydrocarbons (ppb) |
| Clerke Reef MP | Emergent | NC | 151 | NC | NC | NC | NC | NC | NC | 32 | NC | NC |
| Imperieuse MP | Emergent | NC | 121 | NC | 113 | NC | NC | NC | NC | 26 | 18 | NC |
| Rowley Shoals surrounds | Submerged | NC | NC | NC | 100 | NC | NC | NC | NC | NC | 27 | NC |
| State Waters-WA | Submerged | NC | NC | NC | 113 | NC | NC | NC | NC | NC | 18 | NC |

*NC = No contact*

**Spill modelling results for a 413,367 $m^3$ subsea release of Caley Crude as a result of a LOWC in the Curie operational area**

| Receptor | Receptor Type | Minimum Time to Contact (hrs) | | | | | | | | Maximum Hydrocarbon Concentrations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Exposure Values | | | | Moderate Exposure values | | High Exposure Values | | | | |
| | | Floating oil (1 g/$m^2$) | Shoreline accumulation (10 g/$m^2$) | Entrained hydrocarbons (1,000 ppb) | Dissolved hydrocarbons (10 ppb) | Floating oil (10 g/m2) | Shoreline accumulation (100 g/$m^2$) | Floating oil (50 g/$m^2$) | Shoreline accumulation (1,000 g/$m^2$) | Shoreline accumulation (g/$m^2$) | Dissolved hydrocarbons (ppb) | Entrained hydrocarbons (ppb) |
| Barrow-Montebello Surrounds | Intertidal | 326 | NC | NC | 622 | NC | NC | NC | NC | NC | 56 | NC |
| Barrow Island | Emergent | NC | NC | NC | 724 | NC | NC | NC | NC | NC | 29 | NC |
| Brewis Reef | Submerged | NC | NC | NC | 1,670 | NC | NC | NC | NC | NC | 11 | NC |
| Clerke Reef MP | Emergent | 246 | 254 | 162 | 233 | NC | 255 | NC | NC | 443 | 568 | 1,929 |
| Dampier AMP | Submerged | 100 | NC | NC | 315 | NC | NC | NC | NC | NC | 254 | NC |
| Dampier Archipelago | Emergent | 142 | 167 | NC | 587 | NC | NC | NC | NC | 49 | 86 | NC |
| Eighty Mile Beach AMP | Submerged | NC | NC | NC | 543 | NC | NC | NC | NC | NC | 23 | NC |
| Gascoyne AMP | Submerged | 1,297 | NC | NC | 793 | NC | NC | NC | NC | NC | 27 | NC |
| Glomar Shoals | Submerged | 93 | NC | NC | 67 | NC | NC | NC | NC | NC | 423 | NC |
| Imperieuse Reef MP | Emergent | 90 | 123 | 162 | 100 | 325 | 213 | NC | 343 | 3,320 | 1,223 | 4,454 |
| Kimberley AMP | Submerged | NC | NC | NC | 690 | NC | NC | NC | NC | NC | 46 | NC |
| Lowendal Islands | Submerged | NC | NC | NC | 729 | NC | NC | NC | NC | NC | 17 | NC |
| Madeleine Shoals | Submerged | 269 | NC | NC | 595 | NC | NC | NC | NC | NC | 42 | NC |
| Mermaid Reef AMP | Intertidal | 329 | NC | 662 | 236 | NC | NC | NC | NC | NC | 589 | 2,196 |
| Montebello AMP | Submerged | 118 | NC | NC | 99 | NC | NC | NC | NC | NC | 211 | NC |
| Montebello Islands | Emergent | 968 | 736 | NC | 630 | NC | NC | NC | NC | 62 | 44 | NC |
| Muiron Islands | Emergent | 1,279 | 745 | 1,058 | 666 | NC | NC | NC | NC | 47 | 26 | 1,090 |

| Receptor | Receptor Type | Minimum Time to Contact (hrs) | | | | | | | | Maximum Hydrocarbon Concentrations | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Low Exposure Values | | | | Moderate Exposure values | | High Exposure Values | | | | |
| | | Floating oil (1 g/m$^2$) | Shoreline accumulation (10 g/m$^2$) | Entrained hydrocarbons (1,000 ppb) | Dissolved hydrocarbons (10 ppb) | Floating oil (10 g/m2) | Shoreline accumulation (100 g/m$^2$) | Floating oil (50 g/m$^2$) | Shoreline accumulation (1,000 g/m$^2$) | Shoreline accumulation (g/m$^2$) | Dissolved hydrocarbons (ppb) | Entrained hydrocarbons (ppb) |
| Ningaloo – Offshore | Submerged | 356 | NC | 562 | 196 | NC | NC | NC | NC | NC | 549 | 1,101 |
| Ningaloo – Outer Coast North | Submerged | 905 | NC | 893 | 556 | NC | NC | NC | NC | NC | 37 | 1,316 |
| Ningaloo – Outer NW | Submerged | 1,184 | NC | 1,356 | 543 | NC | NC | NC | NC | NC | 58 | 1,127 |
| Ningaloo Coast North | Emergent | NC | 1,600 | 962 | 586 | NC | NC | NC | NC | 17 | 31 | 1,026 |
| Outer Argo-Rowley Terrace AMP | Submerged | 162 | NC | 387 | 136 | 343 | NC | NC | NC | NC | 1,041 | 3,054 |
| Penguin Bank | Submerged | NC | NC | NC | 1,251 | NC | NC | NC | NC | NC | 12 | NC |
| Rankin Bank | Submerged | 313 | NC | 877 | 160 | NC | NC | NC | NC | NC | 207 | 1,172 |
| Rosily Shoals | Submerged | NC | NC | | 964 | NC | NC | NC | NC | NC | 18 | NC |
| Rowley Shoals surrounds | Submerged | 66 | NC | 194 | 56 | 183 | NC | 1,006 | NC | NC | 1,769 | 5,186 |
| Southern Islands Coast | Emergent | 770 | 647 | NC | 710 | NC | NC | NC | NC | 40 | 33 | NC |
| WA State Waters | Submerged | 90 | NC | 162 | 100 | 325 | NC | NC | NC | NC | 1,223 | 4,454 |
| Thevenard Islands | Emergent | 1,266 | NC | NC | 1,287 | NC | NC | NC | NC | NC | 21 | NC |
| Trap Reef | Submerged | 1,267 | NC | NC | NC | NC | NC | NC | NC | NC | NC | NC |

*NC = No contact*

## Appendix H2: Hotspot Consequence Summary

| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| Barrow-Montebello Surrounds (Intertidal) | 3 | **Physical habitats**<br>• Coral reefs habitat<br><br>**Marine fauna**<br>*Seabirds*<br>• Migratory birds<br>*Turtles*<br>• Internesting<br>*Whales*<br>• Humpback/pygmy blue whale migration<br><br>**Socio-economic**<br>• Significant for recreational fishing and charter boat tourism | Probability of contact by floating oil at 10 g/m² | % | NC | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>II<br>II<br>II<br>Fauna consequence assessed as Moderate (III) (see Appendix G) due to potential for dissolved oil ≥10 ppb to impact turtle internesting behaviour that can be expected to take place in the waters of Barrow-Montebello MP in relation to nesting that takes place on Barrow Island. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | 405 | 705 | 56 | | | |
| Barrow Island (Emergent) | 3 | **Physical habitats**<br>• Bandicoot Bay – conservation area Fisheries Act (benthic fauna/seabird protection), mudflats, rock platforms, mangroves, clay pans<br>• Mangroves in Bandicoot Bay (considered globally unique)<br>• Coral reefs (eastern side) – Biggada Reef (coral spawning: Mar & Oct)<br>• Biggada Creek<br><br>**Marine Fauna**<br>*Turtles*<br>• Regionally and nationally significant green turtle (western side) and flatback turtle (eastern side) nesting beaches<br>• Turtle Bay north beach<br>• North and west coasts – John Wayne Beach also loggerhead and hawksbill turtles.<br>• Peak turtle nesting periods – Loggerhead turtle nesting: Dec-Jan; green turtle nesting: Nov to Apr, peak period from Jan to Feb; flatback turtle nesting: Dec to Jan; hawksbill turtle nesting: Oct to Jan<br>*Seabirds*<br>• Migratory birds (important habitat) (important bird area) 10th of top 147 bird sites<br>• Highest population of migratory birds in Barrow Island Nature Reserve (south-south-east island)<br>• Double island important bird nesting (shearwaters, sea eagles)<br>*Whales*<br>• Pygmy blue whale northern migration (Apr to Aug)<br><br>**Socio-economic**<br>• Significant for recreational fishing and charter boat tourism<br>• Nominated place (national heritage)<br>*Cultural heritage*<br>• Important Aboriginal cultural: 13 listed sites incl. pearling camps | Probability of contact by floating oil at 10 g/m² | % | NC | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>II<br>II<br>II<br>Fauna consequence assessed as Moderate (III) (Appendix G) due to potential for dissolved oil ≥10 ppb to impact turtle nesting and pygmy blue whale migration in the vicinity of the island. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | NC | 260 | NC | | | |

| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| Bedout Island (Emergent) | 4 | **Physical habitats**<br>*Coral reefs*<br>• Fringing the small island (0.31 km$^2$)<br>*Sandy beaches*<br>• Sandy cay on limestone bedrock, heavily vegetated with beach spinifex<br><br>**Marine fauna**<br>*Fish*<br>• Pelagic fishes, stingrays and reed sharks may be present at times<br>*Birds*<br>• Important due to brown booby breeding<br>• Seabird breeding colonies present – island supports over 1,000 nesting pairs of Brown Boobies (one of the largest in the world)<br>• Supports nesting of other birds as well<br>• Season for breeding: May to Sep<br>*Marine reptiles*<br>• Foraging area for green, hawksbill, loggerhead turtles<br><br>**Socio-economic and heritage values**<br>• Tourism<br>• Heritage value: three shipwrecks in the surroundings<br>• Nature Reserve | Probability of contact by floating oil at 10 g/m² | % | NC | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>I<br><br>Fauna consequence assessed as Moderate (III) (see Appendix G) due to potential for dissolved oil ≥10 ppb to impact turtle nesting.<br>Physical environment/habitat consequence assessed as Moderate (III) (see Appendix G) due to potential for dissolved oil ≥10 ppb to impact corals. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | m$^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | NC | 446 | NC | | | |
| Clerke Reef MP (Emergent) | 3 | The Rowley Shoals comprise three reef systems 30–40 km apart: Mermaid Reef, Clerke Reef and Imperieuse Reef<br><br>**Physical habitats**<br>*Coral reefs*<br>• Exceptionally rich and diverse intertidal and subtidal reefs<br>• Provide a source of invertebrate and fish recruits for reefs further south and are therefore regionally significant<br>*Seagrasses*<br>• Sparse seagrass found within subtidal areas in Rowley Shoals<br>*Macroalgae*<br>• Small patches may be present in lagoonal area<br>*Sandy beaches*<br>• Bedwell Island is a supratidal, unvegetated, elongated cay about 1.3 km long<br><br>**Marine fauna**<br>*Invertebrates*<br>• A number of invertebrate (echinoderms, cnidarians, molluscs and crustaceans) species commonly found at Scott Reef are also found here although in higher densities due to lack of fishing/collection<br>• Diverse molluscan fauna on flats<br>*Fish and sharks*<br>• Fish populations similar to those on shelf edge reefs in the Indo-Pacific region but unique in WA waters<br>• Rich diversity of fish (500+ species)<br>*Birds*<br>• Bedwell island is site of second largest breeding colony of red-tailed tropic birds, an uncommon species in WA<br>• Wide range of seabirds observed at Rowley Shoals | Probability of contact by floating oil at 10 g/m² | % | 5.67 | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | IV<br>IV<br>IV<br>IV<br>IV<br><br>Consequence ranking assessed as Major (IV) (see Appendix G) due to the potential for high volume (506 m$^3$) of shoreline accumulation ≥100 g/m$^2$ to impact the values of Clerke Reef MP. Also, potential for floating oil ≥10 g/m$^2$ and dissolved oil ≥10 ppb to impact the values of Clerke Reef MP. | IV |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | 4 | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | m$^3$ | 506 | NC | 12 | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | 13,389 | NC | 443 | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | 8 | NC | 3 | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | 2,777 | 232 | 568 | | | |

| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Marine reptiles*<br>• Green and hawksbill turtles are present at the Rowley Shoals<br>• Reefs not known to be regionally significant turtle habitats<br>*Marine mammals*<br>• Northward humpback whale migration pathway adjacent to Rowley shoals, therefore individuals may be present<br>• Variety of toothed and baleen whales likely to be visitors to the area but not Rowley Shoals are not a key aggregation/calving/mating/foraging area<br><br>**Protected areas**<br>• The Rowley Shoals CMR is in place to protect migratory seabirds and endangered loggerhead turtle, sharks, communities and habitats of 220–5,000 m, seafloor features, two KEFS and provides connectivity between Mermaid Reef Marine National Nature Reserve and reefs of the Western Australian Rowley Shoals Marine Park and the deeper waters of the region. It is an IUCN category zoning of II and VI<br><br>**Socio-economic and heritage values**<br>• Tourism: nature based tourism (charter boats, diving, snorkelling) and recreational fishing (although prohibited in certain zones) low usage given distance to mainland<br>• Sanctuary zone within marine park<br>• Indigenous values: none identified<br>• Heritage values: none identified<br>• Prohibition on commercial fishing and a ban on the take of key demersal fish by recreational fishers since 1987<br>• Low level of pressures on shoals make them an important global benchmark for Indo-West pacific reefs<br>• 'Mermaid Reef and the Commonwealth waters surrounding Rowley Shoals' are a designated KEF (an area of high biodiversity with enhanced productivity and feeding and breeding aggregations)<br>• Rowley shoals also have the KEF 'canyons linking the Argo Abyssal Plain with the Scott Plateau' (unique seafloor feature with enhanced productivity and feeding aggregations of species) | | | | | | | | |
| Dampier Archipelago (Emergent) | 3 | **Physical habitats**<br>• Coral reefs<br>• Seagrass<br>• Macroalgae<br>• Mangroves<br><br>**Marine fauna**<br>• Invertebrates<br>*Finfish and rays*<br>• High fish biodiversity approx. 650 species, dwarf sawfish EPBC protected<br>*Birds*<br>• The Dampier Archipelago/Cape Preston region is a nesting area for at least 16 species of seabirds. Many of the islands and rocks in the area are known breeding grounds for birds, including wedge-tailed shearwaters (*Ardenna pacifica*), Caspian terns (*Sterna caspia*), bridled terns (*Onychoprion anaethetus*) and roseate terns (*Sterna dougallii*).<br>*Marine reptiles*<br>• Turtles<br>• Flatbacks – nest on Legendre, Huay, Delambre<br>• Green – significant rookery in NWS | Probability of contact by floating oil at 10 g/m² | % | NC | 0.33 | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for low volume (12 $m^3$) of shoreline accumulation ≥100 $g/m^2$ to impact the values of Dampier Archipelago. Also, potential for floating oil ≥10 $g/m^2$ and dissolved oil ≥10 ppb to impact the values of Dampier Archipelago. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | 22 | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | 2 | 12 | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | 117 | 488 | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | 1 | 3 | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | NC | 752 | 86 | | | |

| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| | | • Olive Ridley – known to forage<br>• Loggerhead – nesting and foraging<br>• Seasnakes<br>*Marine mammals*<br>• Eight species (dugong, whales, dolphins)<br>• migratory pathway for protected humpback whale in Jul to Sept<br><br>**Protected areas**<br>• Commonwealth Marine Reserve<br><br>**Socio-economic and heritage values**<br>• World Heritage (Murujuga Cultural Landscape)<br>• National Heritage Listed<br>• Aboriginal rock art on shorelines, Burrup Peninsula | | | | | | | | |
| Imperieuse Reef MP<br>(Emergent) | 3 | The Rowley Shoals comprise three reef systems 30–40 km apart: Mermaid reef, Clerke reef and Imperieuse reef<br><br>**Physical habitats**<br>*Coral reefs*<br>• Exceptionally rich and diverse intertidal and subtidal reefs<br>• Provide a source of invertebrate and fish recruits for reefs further south and are therefore regionally significant<br>*Seagrasses*<br>• Sparse seagrass found within subtidal areas in Rowley Shoals<br>*Macroalgae*<br>• Small patches may be present in lagoonal area<br>*Sandy beaches*<br>• Area of sand banks (intertidal) and Cunningham Island (an unvegetated sand cay)<br><br>**Marine fauna**<br>*Invertebrates*<br>• A number of invertebrate (echinoderms, cnidarians, molluscs and crustaceans) species commonly found at Scott Reef are also found here although in higher densities due to lack of fishing/collection (Commercial collection is prohibited)<br>*Fish and sharks*<br>• Fish populations similar to those on shelf edge reefs in the Indo-Pacific region but unique in WA waters<br>• Rich diversity of fish (500+ species)<br>*Birds*<br>• Wide range of seabirds observed at Rowley Shoals<br>*Marine reptiles*<br>• Green and hawksbill turtles are present at the Rowley Shoals<br>• Reefs not known to be regionally significant turtle habitats<br>*Marine mammals*<br>• Northward humpback whale migration pathway adjacent to Rowley Shoals, therefore individuals may be present<br>• Variety of toothed and baleen whales likely to be visitors to the area but not Rowley Shoals are not a key aggregation/calving/mating/foraging area<br><br>**Protected areas** | Probability of contact by floating oil at 10 g/m² | % | 10.67 | NC | 2.33 | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | IV<br>IV<br>IV<br>IV<br>IV<br>IV<br><br>Consequence ranking assessed as Major (IV) (see Appendix G) due to the potential for high volume (643 $m^3$) of shoreline accumulation ≥100 $g/m^2$ to impact the values of Imperieuse Reef MP. Also, potential for floating oil ≥10 $g/m^2$ and dissolved oil ≥10 ppb to impact the values of Imperieuse Reef MP. | |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | 4 | NC | 13 | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | 643 | NC | 266 | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | 13,404 | NC | 3,320 | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | 19 | NC | 11 | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | 3,743 | 212 | 1,223 | | | |

| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| | | • Rowley Shoals CMR in place to protect migratory seabirds and endangered loggerhead turtle, sharks, communities and habitats of 220–5,000 m, seafloor features, two KEFS and provides connectivity between Mermaid Reef Marine National Nature Reserve and reefs of the Western Australian Rowley Shoals Marine Park and the deeper waters of the region. It is an IUCN category zoning of II and VI.<br><br>**Socio-economic and heritage values**<br>• Tourism: nature based tourism (charter boats, diving, snorkelling) and recreational fishing (although prohibited in certain zones) low usage given distance to mainland. ~300 visitors/season (DoE, 2007)<br>• Sanctuary zone within marine park<br>• Indigenous values: none identified<br>• Heritage values: none identified<br>• Prohibition on commercial fishing and a ban on the take of key demersal fish by recreational fishers since 1987<br>• Low level of pressures on shoals make them an important global benchmark for Indo-West pacific reefs<br>• Mermaid Reef and the Commonwealth waters surrounding Rowley Shoals' are a designated KEF (an area of high biodiversity with enhanced productivity and feeding and breeding aggregations)<br>• Rowley shoals also have the KEF 'canyons linking the Argo Abyssal Plain with the Scott Plateau' (unique seafloor feature with enhanced productivity and feeding aggregations of species) | | | | | | | | |
| Lowendal Islands<br>(Emergent) | 3 | **Physical habitats**<br>• Important shallow lagoons with seagrass for dugongs<br>• Deep-water benthic (soft-sediment) habitats<br>• Dugong Reef and Batman Reef (eastern side Island)<br>• Mangroves are considered globally unique as they are offshore<br>• Macroalgal reefs (40%)<br><br>**Marine Fauna**<br>*Turtles*<br>• Important hawksbill (Beacon, Parakeelya, Kaia and Pipeline), loggerhead and green turtle nesting (minor) Varanus pipeline, Harriet and Andersons Beaches)<br>• Nesting is reported to occur throughout the year in WA, peaking between October and January<br>• Significant flatback rookery, nesting season for flatback turtles peaks in December and January with subsequent peak hatchling emergence in February and March<br>*Seabirds*<br>• Approximately 89 species of avifauna, 12–14 species of migratory and threatened seabirds<br>*Marine mammals*<br>• Seagrass beds around the Lowendal Islands thought to provide valuable food source for dugongs<br><br>**Protected areas**<br>• The Barrow Island Marine Management Area, most of the waters around Barrow Island, the Lowendal Islands and the Barrow Island Marine Park<br><br>**Socio-economic and heritage values**<br>• Social amenities and other tourism, very significant for recreational fishing and charter boat tourism | Probability of contact by floating oil at 10 g/m² | % | NC | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G due to the potential for low volume (2 $m^3$) of shoreline accumulation ≥100 $g/m^2$ to impact the values of the Lowendal Islands. Also, potential for floating oil ≥10 $g/m^2$ and dissolved oil ≥10 ppb to impact the values of the Lowendal Islands. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | 2 | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | 108 | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | 1 | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | 12 | 164 | 17 | | | |

| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| Mermaid Reef AMP<br>(Intertidal) | 2 | The Rowley shoals comprise three reef systems 30–40 km apart: Mermaid reef, Clerke reef and Imperieuse reef<br>Expired management plan recognised oil spills as potential pressure on water quality (Commonwealth of Australia, 2007)<br>CMR in place to protect corals, sharks, marine turtles, cetaceans and migratory seabirds. It is an IUCN Category IA<br><br>**Physical habitats**<br>*Coral reefs*<br>• Key area for >200 hard coral species and >12 classes of soft corals in pristine condition<br>*Seagrasses*<br>• Small patches in lagoonal area of two species which are commonly found throughout WA waters<br>*Macroalgae*<br>• Small patches may be present in lagoonal area<br>*Sandy beaches*<br>• Not present in submerged area within CMR. Recognise that some sand cays/sand banks are present and may be exposed at low water<br><br>**Marine fauna**<br>*Invertebrates*<br>• A number of invertebrate (echinoderms, molluscs and crustaceans) species commonly found at Scott Reef are also found here although in higher densities due to lack of fishing/collection<br>*Fish and sharks*<br>• Fish populations similar to those on shelf edge reefs in the Indo-Pacific region but unique in WA waters<br>*Birds*<br>• Sandbanks exposed at low tide may be important resting areas for migratory seabirds, no breeding occurs<br>*Marine reptiles*<br>• Small numbers of green turtles have been sighted<br>• Important foraging area for other marine turtles<br>*Marine mammals*<br>• Northward humpback whale migration pathway adjacent to CMR, therefore individuals may be present<br>• CMR designated as important for other whales and dolphins<br><br>**Socio-economic and heritage values**<br>• Tourism: private and charter vessels for snorkelling/diving, limited shore based activities and recreational fishing (although prohibited with AMP) given distance to mainland<br>• Indigenous value: None identified<br>• Heritage value: 1 shipwreck present that could be contacted by entrained oil<br>• Commercial fishing: a number are licensed to operate in deeper waters surrounding the CMR<br>• ‘Mermaid Reef and the Commonwealth waters surrounding Rowley shoals’ are a designated KEF (an area of high biodiversity with enhanced productivity and feeding and breeding aggregations)<br>• Rowley shoals also have the KEF ‘canyons linking the Argo Abyssal Plain with the Scott Plateau’ (unique seafloor feature with enhanced productivity and feeding aggregations of species) | Probability of contact by floating oil at 10 g/m² | % | 2.33 | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for floating oil ≥10 g/m² and dissolved oil ≥10 ppb to impact the values of the Mermaid Reef AMP. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | 3 | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | 1,460 | 300 | 589 | | | |

| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| Montebello AMP (Submerged) | 3 | **Physical habitats**<br>• Coral reefs habitat<br><br>**Marine fauna**<br>*Seabirds*<br>• Migratory birds<br>*Turtles*<br>• Internesting<br>*Whales*<br>• Humpback/pygmy blue whale migration<br><br>**Socio-economic**<br>• Significant for recreational fishing and charter boat tourism | Probability of contact by floating oil at 10 g/m² | % | NC | 0.33 | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for floating oil ≥10 g/m² and dissolved oil ≥10 ppb to impact the values of the Montebello AMP. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | 13 | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | 726 | 2,130 | 211 | | | |
| Montebello Islands (Emergent) | 3 | **Physical habitats**<br>• Reefs – coral spawning: Mar & Oct<br>• Algae (40%)<br>• Mangroves (considered globally unique as they are offshore)<br>• Fish habitat<br>• Intertidal sand flat communities<br><br>**Marine fauna**<br>*Turtles*<br>• Loggerhead and green (significant rookery), hawksbill, flatback turtles – Loggerhead turtle nesting: Dec-Jan; green turtle nesting: Nov to Apr, peak period from Jan-Feb; flatback turtle nesting: Dec-Jan; hawksbill turtle nesting: Oct to Jan<br>• Northwest and Eastern Trimouille Islands (hawksbill)<br>• Western Reef and Southern Bay at Northwest Island (green)<br>*Seabirds*<br>• Migratory and threatened seabirds – 14 species<br>• Significant nesting (Sep to Feb), foraging and resting areas<br>*Whales*<br>• Humpback (Jun to Jul), Pygmy blue (Apr to Aug) whale migration<br><br>**Socio-economic**<br>• Pearling (inactive/pearling zones)<br>• Very significant for recreational fishing and charter boat tourism<br>• Social amenities and other tourism<br>• Nominated place (national heritage) | Probability of contact by floating oil at 10 g/m² | % | NC | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for low volume (5 $m^3$) of shoreline accumulation ≥100 g/m² to impact the values of the Montebello Islands. Also, potential for dissolved oil ≥10 ppb to impact the values of the Montebello Islands. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | 5 | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | 220 | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | 2 | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | 248 | 794 | 44 | | | |
| Muiron Islands (Emergent) | 2 | The Muiron Islands are part of the Ningaloo World Heritage Area.<br><br>**Physical habitats**<br>*Coral reefs* | Probability of contact by floating oil at 10 g/m² | % | NC | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas | III<br>III<br>III<br>III | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | NC | | | |

| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| | | • Soft coral communities dominate the reefs on the western side of the Muiron Islands whilst habitats on the eastern side of the Muiron Islands are more sheltered, consisting of sandy beaches and shallow lagoons with diverse soft and hard coral communities (Cassata & Collins, 2008)<br>• The northern boundary substrate can be described as a combination of sand covered limestone pavement (Quadrant Energy, 2016)<br>*Seagrasses*<br>• Identified on the eastern side of the Muiron Islands<br>*Macroalgae*<br>• Seagrass and macroalgal habitats are present within the NWS region including Muiron Islands (eastern side)<br>• Sandy beaches<br>• The western shores comprise sandy beaches sloping away to the shelf backed by low dunes<br><br>**Marine fauna**<br>*Invertebrates*<br>• Not identified within the area although noted in the deeper offshore environment or the more protected environment of the nearby Exmouth Gulf (refer Ningaloo Hotspots)<br>*Fish and sharks*<br>• Shark aggregations are seasonally reported and manta rays are commonly found in the area<br>*Seabirds*<br>• Significant bird breeding. Several BIAs for breeding/nesting/roosting, foraging and resting include the Muiron Islands<br>• there are five known rookeries as well isolated rookeries on the Muiron and Sunday Islands<br>*Marine reptiles – turtles*<br>• Provides important aggregation and nesting areas for turtle populations, including the loggerhead (Caretta caretta) and green (Chelonia mydas)<br>• The North West Cape and Muiron Islands are major nesting sites for loggerhead turtles, with ~400 and 600 females nesting annually on the Ningaloo Coast (particularly, North West Cape area) and Muiron Islands respectively (DEP, 2001)<br>• The Recovery Plan for Marine Turtles in Australia (2003) identifies the Muiron Islands (as a principal rookery), and all waters within a 20 km radius as habitat critical to the survival of loggerhead turtles<br>• The Muiron Islands are minor nesting sites for flatback and hawksbill turtles (DEC 2009a)<br>*Marine mammals*<br>• Seasonal aggregations of whale sharks, manta rays, sea turtles and rays.<br>• Whale sharks Mar to Jul<br>• Pygmy Blue Whale feeding<br><br>**Protected areas**<br>• The Ningaloo Coast World Heritage Area (WHA) also includes the Muiron Islands as having outstanding universal value for the Ningaloo Coast (Refer to Ningaloo Coast Hot Spot)<br>• The Ningaloo Coast WHA includes Muiron Island Marine Management Area (including the Muiron Islands) category IA – Sanctuary Zone (islands) and II – Marine National Park Zone<br><br>**Socio-economic and heritage values** | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | 2 | NC | Socio-Economic Receptors | Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for low volume (2 $m^3$) of shoreline accumulation ≥100 $g/m^2$ to impact the values of the Muiron Islands. Also, potential for dissolved oil ≥10 ppb to impact the values of the Muiron Islands. | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | 159 | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | 1 | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | NC | 392 | NC | | | |

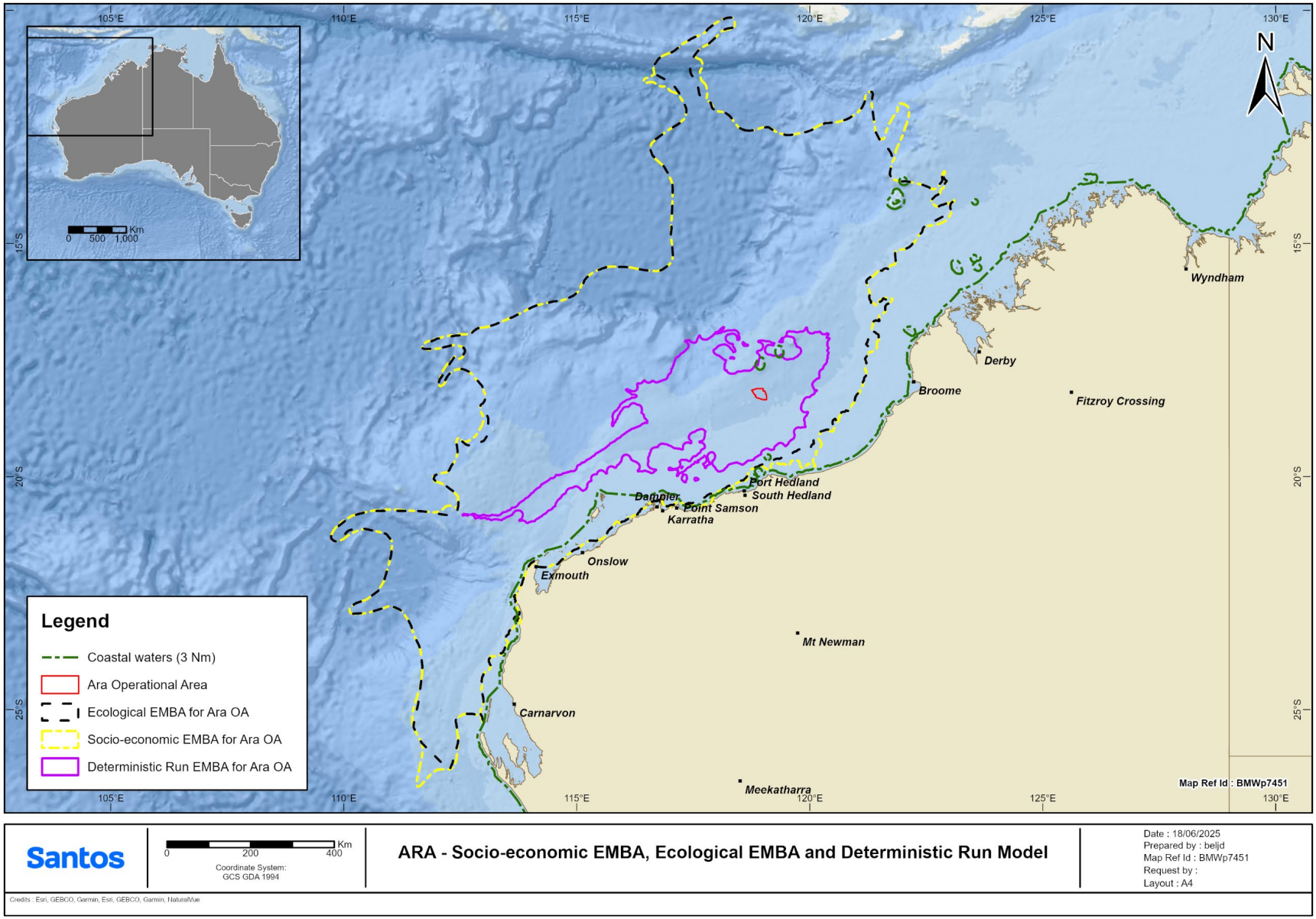
| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| | | • Significant for recreational fishing and charter boat tourism Social amenities and other tourism such as commercial dive charters<br>• The unclassified waters of the Muiron Islands Marine Management area are also open to commercial fishing in accordance with the Fish Resources Management Act 1994 (FRM Act)<br>• The Management Plan for the Ningaloo Marine Park and Muiron Islands Marine Management Area (2005–2015) identifies that the area has significant indigenous heritage value associated with historical and current use but the linkage appears to be directly related to the Ningaloo Reef and the adjacent foreshore as opposed to the Muiron Islands | | | | | | | | |
| Ningaloo – Offshore<br>(Submerged) | 2 | **Physical habitats**<br>• The Ningaloo Reef itself and its juxtaposition with coastal terraces, limestone plains, reef sediments. The contact of the reef by entrained oil may reduce the aesthetic appeal and diminish these values.<br><br>**Marine fauna**<br>• Marine mammals<br>• Seasonal aggregations of whale sharks, manta rays, sea turtles and rays.<br>• Whale sharks Mar-Jul.<br>• Loggerhead turtles.<br>• Green turtles Dec-Mar.<br>• Low density hawksbill turtles.<br>• Pygmy blue whale feeding.<br><br>**Socio-economic and heritage values**<br>• Very significant for recreational fishing, game fishing and charter boat tourism.<br><br>**Protected Areas**<br>• World Heritage Areas.<br>• Australian Marine Park. | Probability of contact by floating oil at 10 g/m² | % | NC | 0.33 | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for floating oil ≥10 g/m² and dissolved oil ≥10 ppb to impact the values of Ningaloo – Offshore. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | 19 | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | 632 | 2.528 | 549 | | | |
| Ningaloo – Outer Coast North<br>(Submerged) | 1 | **Physical habitats**<br>• The Ningaloo Reef itself and its juxtaposition with coastal terraces, limestone plains, reef sediments. The contact of the reef by entrained oil may reduce the aesthetic appeal and diminish these values.<br><br>**Marine fauna**<br>• Marine mammals<br>• Seasonal aggregations of whale sharks, manta rays, sea turtles and rays.<br>• Whale sharks Mar-Jul.<br>• Loggerhead turtles.<br>• Green turtles Dec-Mar.<br>• Low density hawksbill turtles.<br>• Pygmy blue whale feeding.<br><br>**Socio-economic and heritage values**<br>• Very significant for recreational fishing, game fishing and charter boat tourism.<br><br>**Protected Areas**<br>• World Heritage Areas.<br>• Australian Marine Park. | Probability of contact by floating oil at 10 g/m² | % | NC | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for dissolved oil ≥10 ppb to impact the values of Ningaloo – Outer Coast North. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | NC | 331 | NC | | | |

| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| Ningaloo Coast North (Emergent) | 1 | **Physical habitats**<br>• Contains part of the largest fringing reef in Australia<br>• Lagoonal., intertidal and subtidal coral communities<br>• Nine species of seagrass + macroalgae beds<br>• Mangrove bay – Significant for mangroves<br>• Yardie Creek – Significant mangroves and tidal creek<br><br>**Marine fauna**<br>*Marine mammals*<br>• Seasonal aggregations of whale sharks, manta rays, sea turtles and rays.<br>• Whale sharks March-July<br>• Loggerhead turtles<br>• Green Turtles Dec-March<br>• Low density Hawksbill turtles<br>• Pygmy Blue whale feeding<br>*Seabirds*<br>• 33 species of seabirds and avifauna. Main breeding areas at Mangrove Bay, Mangrove Point, Point Maud, the Mildura Wreck Site and Fraser Island<br><br>**Protected Areas**<br>• Includes 13 out of the 18 sanctuary zones under the state MP.<br>• World Heritage Areas<br>• Exmouth Peninsula Karst System is an official value of the National Heritage Area<br><br>**Socio-economic and heritage values**<br>• Tourism<br>• Recreational Fishing<br>• Fishing and charter boat tourism<br>• Indigenous cultural heritage values | Probability of contact by floating oil at 10 g/m² | % | NC | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for dissolved oil ≥10 ppb to impact the values of the Ningaloo Coast North. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | NC | 323 | NC | | | |
| Ningaloo Outer NW (Submerged) | 3 | **Physical habitats**<br>• Coral reef<br>• Seagrasses<br>• Macroalgal beds<br>• Non-coral benthic habitats<br>• high and unique sponge biodiversity<br><br>**Marine fauna**<br>• Invertebrates<br>• Cetacean migration<br>• Whale sharks – migratory and aggregation site<br>• Manta rays aggregation<br>• 500 finfish species recorded<br>*Birds*<br>• 33 species seabirds and avifauna present (13 resident and 20 migratory)<br>• 13 JAMBA/CAMBA species<br>*Marine mammals*<br>• 13 species of toothed whale and dolphin and seven species of baleen whale | Probability of contact by floating oil at 10 g/m² | % | NC | NC | NC | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for dissolved oil ≥10 ppb to impact the values of the Ningaloo Outer NW. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | NC | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >10 ppb | ppb | 89 | 205 | 58 | | | |

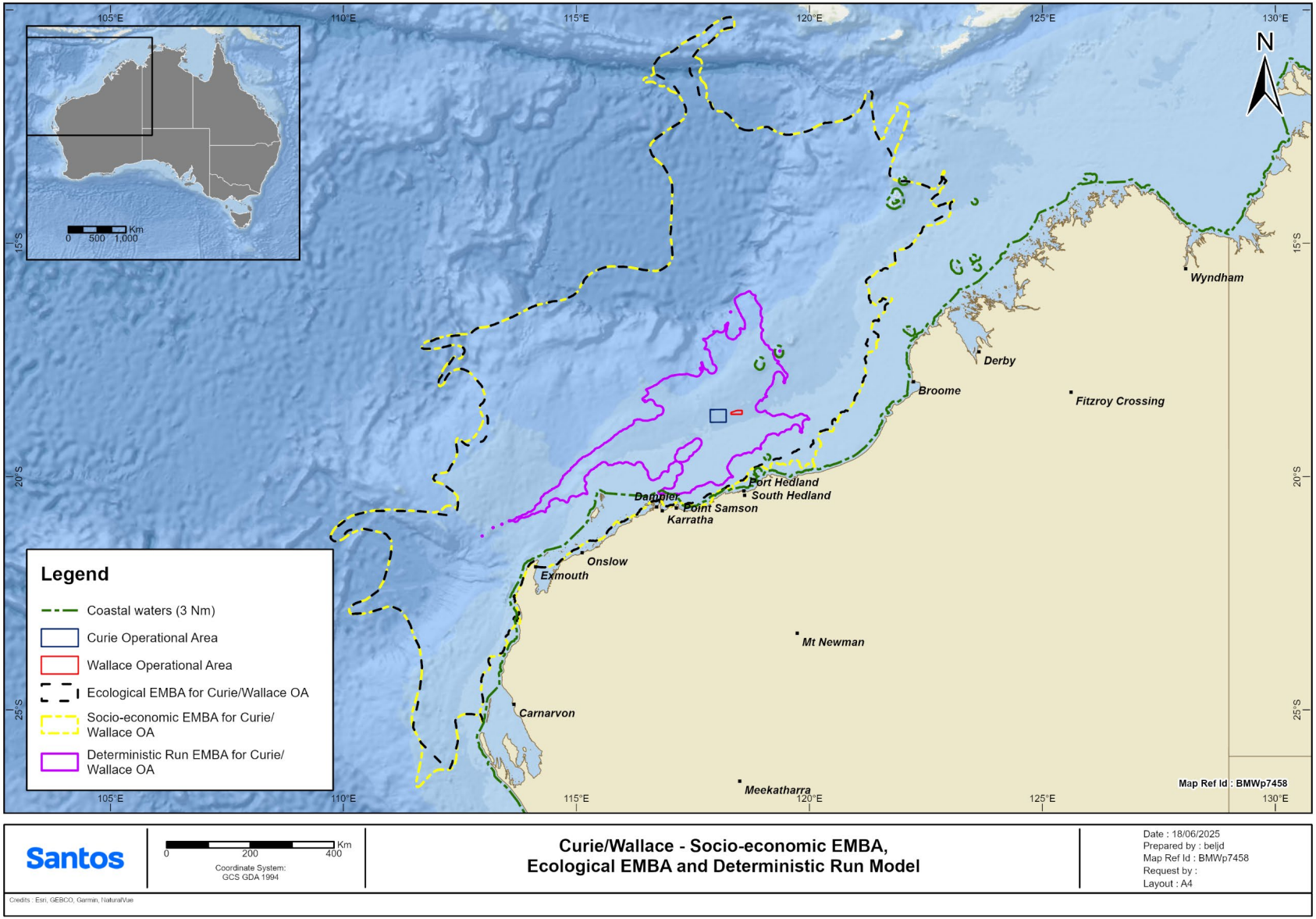
| Receptor (Hotspot) Name | HEV Ranking | Values | Oil spill Modelling Parameter NC = No Contact | | Ara LOWC | Mestrel/ Bancroft LOWC | Curie LOWC | Consequence Category | Consequence Ranking | Final |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Protected area**<br>• Key Ecological Feature (Commonwealth waters adjacent to Ningaloo Reef) and Continental Slope Demersal Fish Communities<br><br>**Socio-economic and heritage values**<br>• Sanctuary zones under state MP<br>• National Heritage Place<br>• Shipwrecks important as diving sites | | | | | | | | |
| Rowley Shoals surrounds (Submerged) | 3 | See information on Mermaid Reef, Imperieuse Reef, Clerke Reef for Rowley Shoals | Probability of contact by floating oil at 10 g/m² | % | 14.67 | NC | 3.00 | Threatened/Migratory Fauna<br>Physical Environment/ Habitat<br>Protected Areas<br>Socio-Economic Receptors | III<br>III<br>III<br>III<br>III<br><br>Consequence ranking assessed as Moderate (III) (see Appendix G) due to the potential for floating oil ≥10 g/m² and dissolved oil ≥10 ppb to impact the values of the Rowley Shoals surrounds. | III |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | 1 | NC | 7 | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | NC | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | NC | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | NC | | | |
| | | | Maximum concentration of dissolved hydrocarbon >50 ppb | ppb | 5,660 | 484 | 1,769 | | | |
| | | | Minimum time to contact by floating oil 10 g/m² | Time (days) | NC | NC | | | | |
| | | | Maximum accumulated oil ashore >100 g/m² | $m^3$ | NC | NC | | | | |
| | | | Maximum accumulated concentration >100 g/m² | g/m² | NC | NC | | | | |
| | | | Maximum length of shoreline oiled (>100 g/m²) | km | NC | NC | | | | |
| | | | Maximum concentration of dissolved hydrocarbon >50 ppb | ppb | 62 | NC | | | | |

# Appendix H3: Socio-economic EMBA, ecological EMBA and deterministic model run for each modelled LOWC scenario

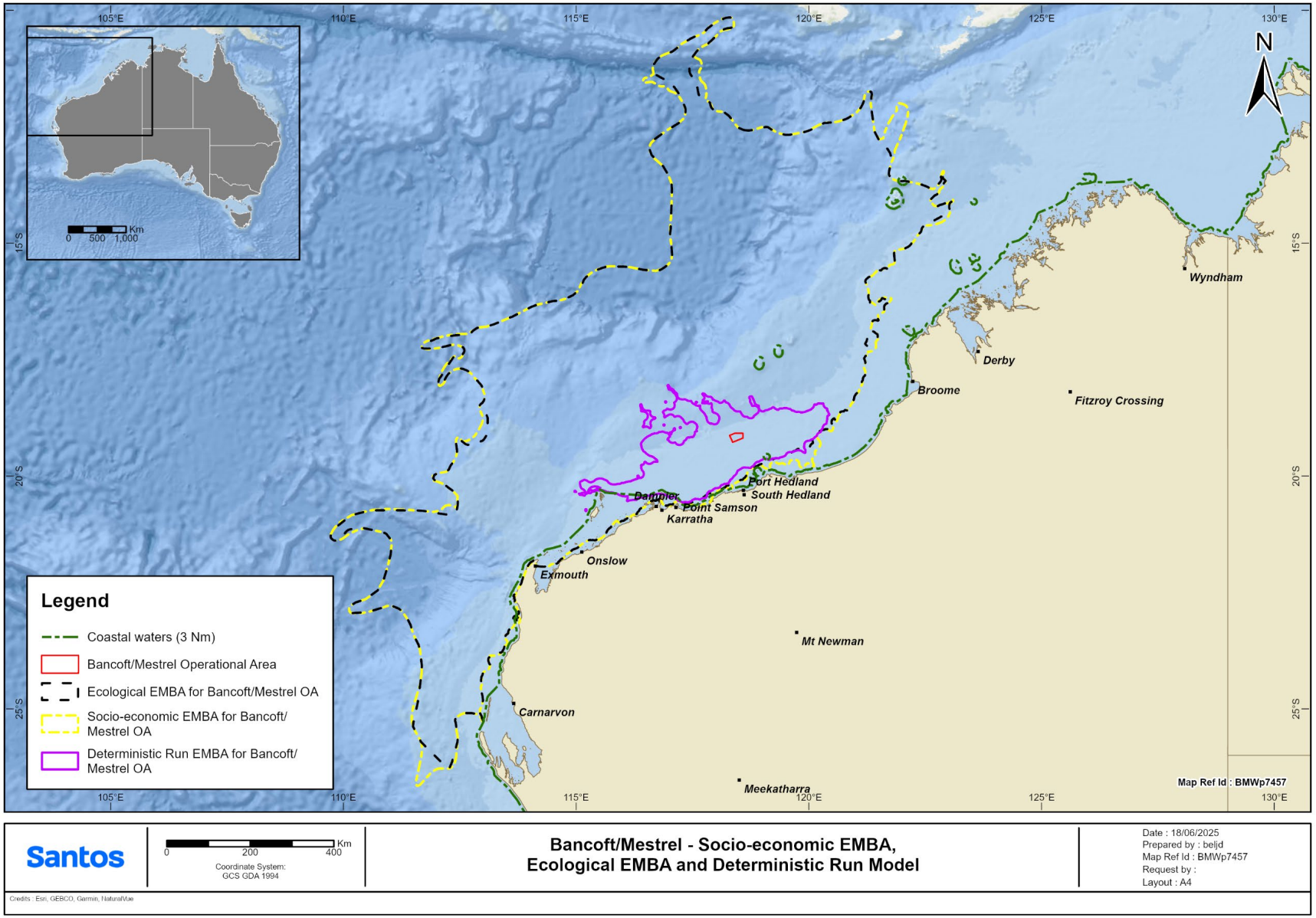
**Ara Operational Area -**



## Curie Operational Area

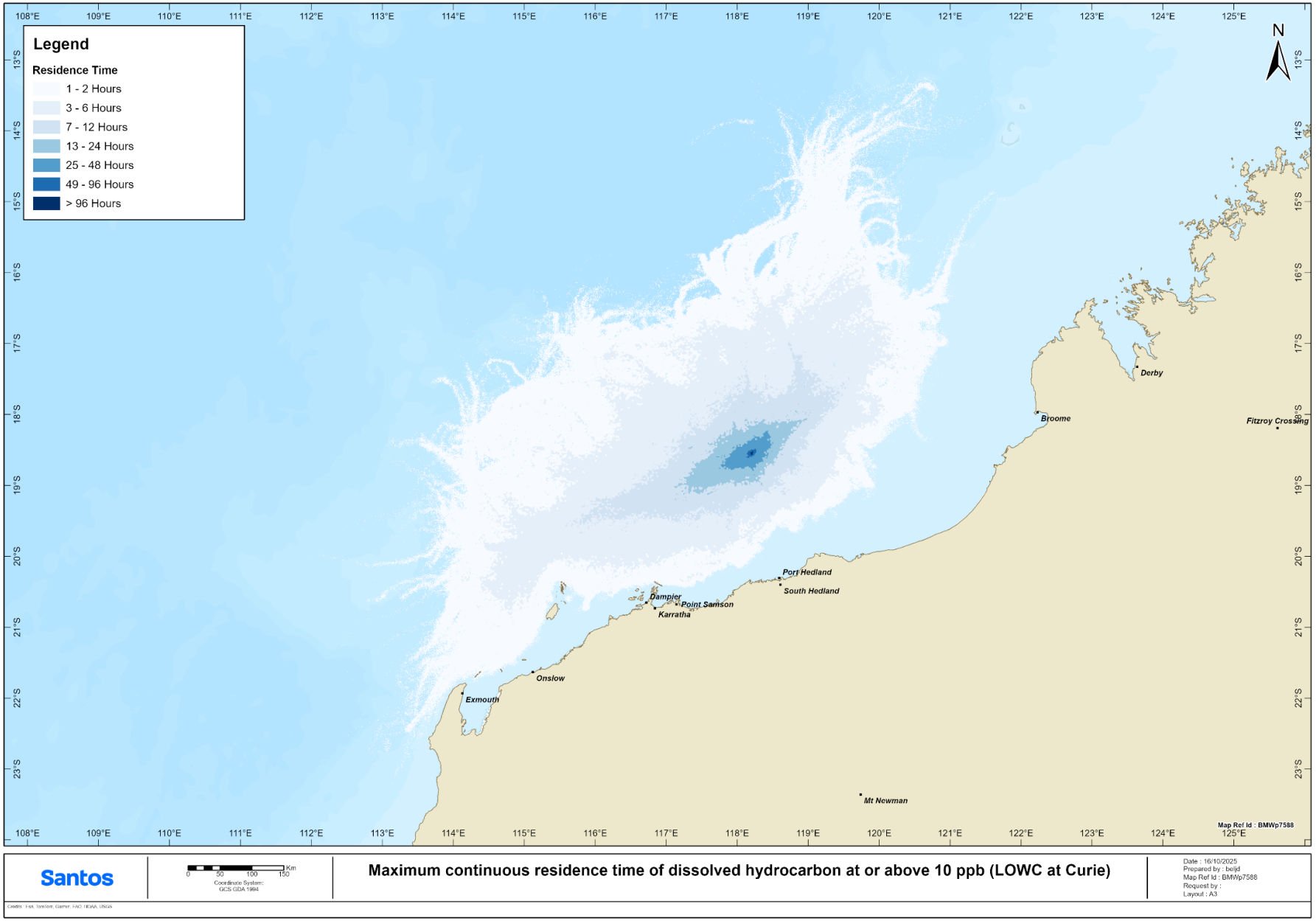


## Mestrel/Bancroft Operational Area

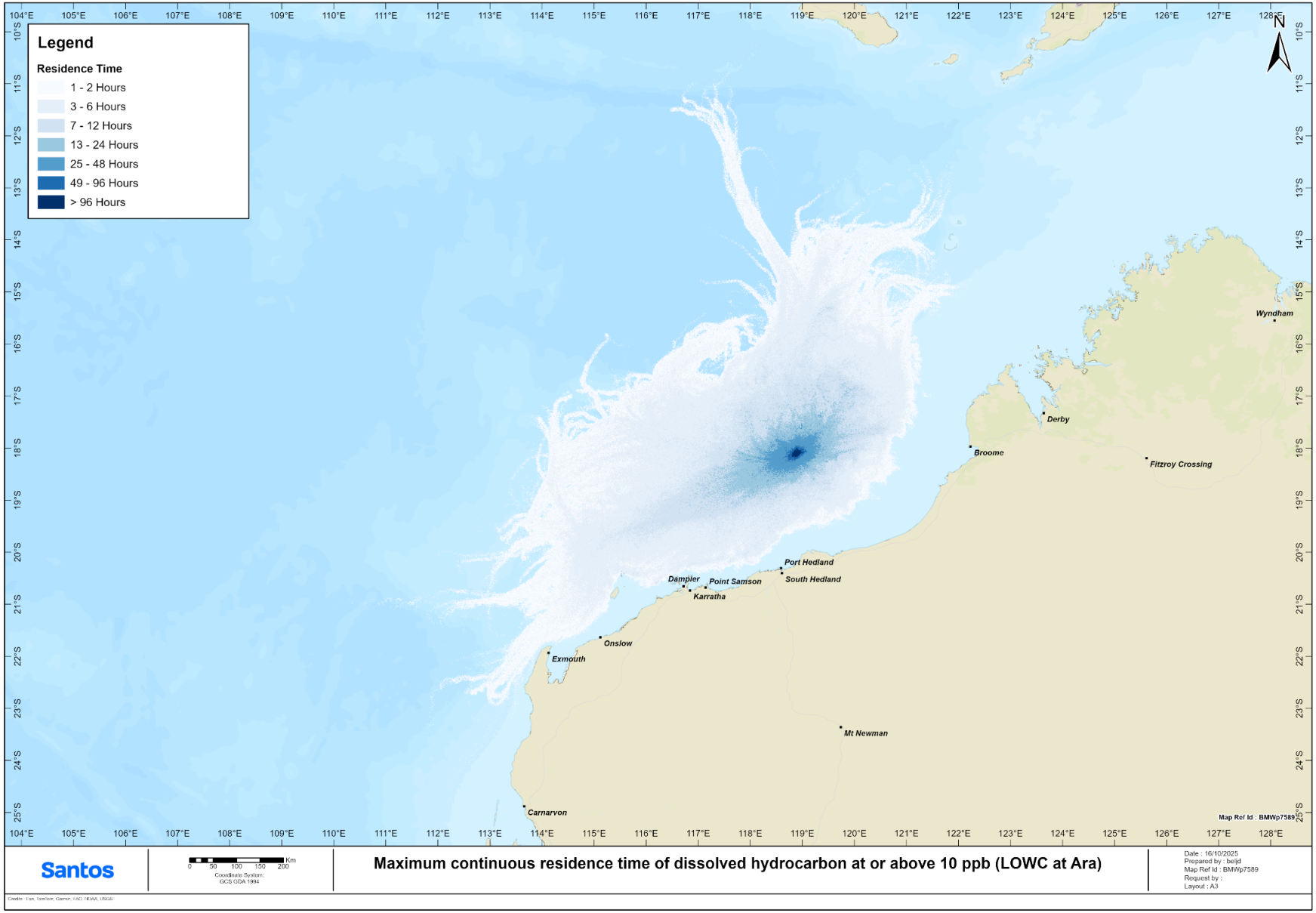


# Appendix H4: Maximum continuous residence times for dissolved hydrocarbon at or above 10 ppb

## Curie OA


Legend
Residence Time
1 - 2 Hours
3 - 6 Hours
7 - 12 Hours
13 - 24 Hours
25 - 48 Hours
49 - 96 Hours
> 96 Hours
N
Derby
Broome
Fitzroy Crossing
Port Hedland
South Hedland
Dampier
Point Samson
Karratha
Onslow
Exmouth
Mt Newman
Map Ref Id : BMWp7588
Santos
Km
0 50 100 150
Coordinate System:
GCS GDA 1994
Maximum continuous residence time of dissolved hydrocarbon at or above 10 ppb (LOWC at Curie)
Date : 16/10/2025
Prepared by : beljd
Map Ref Id : BMWp7588
Request by :
Layout : A3

## Ara OA


Legend
Residence Time
1 - 2 Hours
3 - 6 Hours
7 - 12 Hours
13 - 24 Hours
25 - 48 Hours
49 - 96 Hours
> 96 Hours
N
Wyndham
Derby
Broome
Fitzroy Crossing
Port Hedland
South Hedland
Dampier
Point Samson
Karratha
Onslow
Exmouth
Mt Newman
Carnarvon
Map Ref Id : BMWp7589
Santos
Coordinate System: GCS GDA 1994
Maximum continuous residence time of dissolved hydrocarbon at or above 10 ppb (LOWC at Ara)
Date : 16/10/2025
Prepared by : beljd
Map Ref Id : BMWp7589
Request by :
Layout : A3

## Mestrel/Bancroft OA

