Esso Australia Resources Pty Ltd

Gippsland Basin Decommissioning
Campaign #1 Steel Piled Jackets
End State Environment Plan

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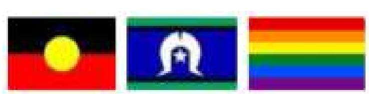

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Abbreviations

Abbreviation	Definition
AHO	Australian Hydrographic Office
AIMS	Australian Institute of Marine Science
ALARP	As Low As Reasonably Practicable
AMC	Australian Maritime College
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
APPEA	Australian Petroleum Production & Exploration Association Ltd
ATBA	Area To Be Avoided
BIA	Biologically Important Area
BKA	Blackback
BMA	Bream A
BMB	Bream B
BOM	Bureau of Meteorology
C&P	Care and Preservation
CBA	Cobia
CGS	Concrete Gravity Structure
CoP	Cessation of Production
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSV	Construction support vessel
CTS	Commonwealth Trawl Sector
DAWE	Department of Agriculture, Water and the Environment
DAWR	Department of Agriculture and Water Resources
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEWHA	Department of the Environment, Water, Heritage and the Arts
DoEE	Department of the Environment and Energy
DPA	Dolphin

Abbreviation	Definition
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EAC	East Australian Current
EAPL	Esso Australia Pty Ltd
EMS	Environmental Management System
EOBO	Equal or Better Outcome
EP	Environment Plan
EPBC	Environment Protection Biodiversity Conservation
EPO	Environmental Performance Outcome
EPS	Environmental Performance Standard
ESD	Ecologically Sustainable Development
Esso	Esso Australia Resources Pty Ltd a.k.a EARPL
FLA	Flounder
FTA	Fortescue
GBJV	Gippsland Basin Joint Venture
HLA	Halibut
HLV	Heavy Lift Vessel
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ICCP	Induced current cathodic protection
IMO	International Maritime Organisation
IMR	Inspection Maintenance and Repair
IMS	Invasive marine species
IUCN	International Union for Conservation of Nature
JUR	Jack Up Rig
KEF	Key ecological feature
KFA	Kingfish A
KFB	Kingfish B
MKA	Mackerel

Abbreviation	Definition
MNES	Matters of national environmental significance
MODU	Mobile Offshore Drilling Unit
MPSV	Multi-Purpose Support Vessel
MSL	Mean sea level
NOAA	National Ocean and Atmospheric Administration
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOPTA	National Offshore Petroleum Titles Administrator
NORM	Naturally occurring radioactive material
OA	Operational Area
OGUK	Oil and Gas UK
OPEP	Oil Pollution Emergency Plan
ORC	Onshore reception centre
P&A	Plug and abandonment
P&S	Plugged and secured
PAH	Polycyclic aromatic hydrocarbon
PCA	Perch
PSZ	Petroleum Safety Zone
ROV	Remotely operated vehicle
SACP	Sacrificial anode cathodic protection
SESSF	Southern and Eastern Scalefish and Shark Fishery
SETFIA	South East Trawl Fishing Industry Association
SGSHS	Shark Gillnet and Shark Hook Sectors
SPJ	Steel Piled Jacket
SSHE	Safety, Security, Health & Environment
SSJF	Southern Squid Jig Fishery
TAC	Total allowable catches
TEC	Threatened ecological community

Abbreviation	Definition
TPAH	Total polycyclic aromatic hydrocarbons
TRH	Total recoverable hydrocarbons
TSS	Traffic Separation Scheme
TSSC	Threatened Species Scientific Committee
VFA	Victorian Fisheries Authority
WIMS	Wells Integrity Management System
WKF	West Kingfish
WTA	Whiting

Units

Abbreviation	Unit
psu	Practical Salinity Units
PM	Particulate Matter
^{o}C	Degrees Celsius
MT	Metric Tonnes
m	Metres
km	Kilometres
m^2	Square metre
Sec	Second

1 Introduction

1.1 Gippsland Basin Decommissioning Overview

Esso Australia Resources Pty Ltd (Esso) is the operator of joint ventures for the exploration, development and production of oil and gas from Bass Strait, Victoria. The offshore Bass Strait production network is comprised of 421 wells, 19 offshore platforms and five subsea facilities that are inter-connected by over 800 kilometres of pipelines. Esso has been producing oil and gas in Bass Strait since 1969 and in this time has supplied over 50 percent of Australia's crude oil and liquids and over 40 percent of all of Eastern Australia's natural gas, hence contributing significantly to the national economy and supporting growth in industry and employment. Although the Bass Strait production network has been producing energy for more than 50 years, it remains today the largest single source of gas supply to the Australian east coast domestic market, and has the potential to continue supplying one third of south east Australia's domestic gas demand through to the end of this decade.

After delivering energy to Australia for over 50 years, many of the Bass Strait fields are now reaching the end of their productive life. Esso is well underway in the planning and preparation of non-producing (and soon to be non-producing) platforms for the first Bass Strait decommissioning campaign (Campaign #1), with topsides dismantling to commence as soon as reasonably practicable and no later than 2027, in accordance with General Direction #817 (refer Section 2.1.1.1). Work currently in progress includes the plug and abandonment (P&A) of wells that have ceased production and the care and preservation of platforms and pipelines in preparation for removal. Production of oil and gas from the Gippsland Basin also continues via the interconnected system of platforms and pipelines.

Figure 1-5 provides a high level indicative Gippsland Basin decommissioning timeline which is expected to evolve as decommissioning planning continues. Decommissioning planning is reviewed with NOPSEMA during the course of scheduled regular meetings, and included in the Annual Decommissioning Report (which is publicly available). While Plug and Abandonment (P&A) work and detailed planning is underway for the final decommissioning of the non-producing (and soon to be non-producing) parts of the Bass Strait network, further decommissioning is required in the future for remaining infrastructure which continues to deliver gas to Australia today.

An assessment of the decommissioning requirements for the non-producing, and soon to be non-producing, offshore infrastructure has been undertaken. This determined that grouping infrastructure into three common types Steel Piled Jacket (SPJ) platforms, pipelines/umbilicals and Concrete Gravity Structure (CGS) platforms would enable assessment of the shared characteristics, environmental impacts and removal techniques required to achieve the decommissioning of each type. As a result, separate EPs will be submitted for each infrastructure group. This EP relates to SPJ platforms. EPs for the two other infrastructure groups (pipelines/umbilicals and CGS platforms) will be submitted separately, as outlined in Table 1-1.

The activities described in this EP relate to the proposed decommissioning end states for Campaign #1 SPJ facilities in Bass Strait where, following the undertaking of an Options Assessment, an end state is proposed that is different to the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (Cmth) (OPGGS Act) Section 572(3) requirement for complete removal of all property.

In accordance with Section 572(3) of the OPGGS Act a titleholder must remove from the title area all structures that are, and all equipment and other property that is, neither used nor to be used in connection with the operations. Section 572(7) of the OPGGS Act also provides that the obligation to remove all property is subject to other provisions of the OPGGS Act and its associated regulations, directions and other applicable laws. This provides a mechanism for titleholders to demonstrate that proposed deviations from the requirement to remove all property in accordance with Section 572(3) are acceptable. These proposed deviations are presented to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment in an EP, along with appropriate justification that a proposed deviation will result in an 'equal or better environmental outcome' than complete removal.

If a proposed deviation is not accepted, the titleholder must then remove all property from the title area. An EP which assesses the environmental impacts and risks of the complete removal of all property must also be submitted to NOPSEMA for assessment.

The scope of this EP includes the following Campaign #1 Steel Piled Jackets (SPJs):

- Halibut (HLA)
- Fortescue (FTA)
- Cobia (CBA)
- Mackerel (MKA)
- Kingfish A (KFA)
- Kingfish B (KFB)
- West Kingfish (WKF)
- Flounder (FLA)
- Bream A (BMA)
- Whiting (WTA).

Esso has undertaken an Options Assessment of potential end state options for the Campaign #1 SPJs, including an options feasibility screening and a detailed environmental impacts, risks and benefits assessment of all of the end state options assessed as 'feasible'. In accordance with the Australian Government Decommissioning Guideline, issued February 2022 (see Section 2.4.1), an end state option that does not result in the complete removal of all property requires demonstration that this option delivers 'equal or better environmental outcomes' as compared to complete removal. As such, an 'equal or better environmental outcome assessment' was undertaken, comparing the impacts, risks and benefits of feasible end state options which do not result in complete removal against complete removal of the SPJs. The methodology, results and conclusion of the Options Assessment are presented in Section 3.

Following the Options Assessment, the proposed end state options for the Campaign #1 SPJs are:

- Lower sections of HLA, FTA, CBA, MKA, KFA, KFB, WKF and FLA SPJs (including strut footings where present and foundation piles below the seabed) decommissioned in place - SPJs cut to ensure a minimum 55m clearance below mean sea level
- SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – SPJs cut as close as practicable to the seabed (without large scale dredging).

Two options are under consideration for the disposal of the upper sections of the SPJs removed. These are:

- removed sections are transported to an onshore reception centre (ORC) for dismantling and onshore recycling/disposal (the location of this ORC has not yet been determined).
- removed sections are placed adjacent to the lower sections of the SPJ remaining in place, entirely within the title area (this option is only relevant for HLA, CBA, MKA, KFA, KFB, WKF, and FLA. FTA, WTA and BMA are not considered for placement because there is insufficient water depth to accommodate placed sections and achieve a minimum 55m clearance at these locations).

The retention of the marine ecosystems that have established on and around the SPJs over the past 50 years was assessed as the key differentiator between the complete removal of the SPJs and the proposed end state options presented in this EP.

Campaign #1 also includes the decommissioning of the Perch (PCA) and Dolphin (DPA) monotowers. As discussed below in Section 1.2.1, these monotowers will be fully removed and hence do **not** form part of the scope of this EP. The activities to remove PCA and DPA will be assessed in the Campaign #1 – End State Execution EP/s which will be submitted at a later date.

This EP has been prepared as part of the requirements under the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009* (OPGGS (Environment) Regulations), as administered by NOPSEMA.

1.2 Scope

The purpose of this EP is to present the results of the Options Assessment undertaken for the Campaign #1 SPJs and to gain acceptance for the proposed end states for the SPJs listed in Section 1.1.

The execution activities required to achieve these end states (i.e. cutting, lifting and removal of SPJs for either onshore disposal or seabed placement and removal of topsides for onshore disposal) are not within the scope of this EP and are subject to a future Campaign #1 – End State Execution EP/s which will be submitted at a later date. Hence there are no execution, or in the field ‘activities’ within the scope of this EP.

An overview of what is included in this EP, and what is not included in this EP, is shown in Table 1-1. The petroleum titles relevant to this EP are listed in Appendix A1.

Table 1-1 Scope of this Environment Plan

Included	Not included and where addressed
Proposed end states for the Campaign #1 SPJs: • Lower sections of HLA, FTA, CBA, MKA, KFA, KFB, WKF and FLA SPJs (including strut footings where present and foundation piles below the seabed) decommissioned in place - SPJs cut to ensure a minimum 55m clearance below mean sea level (MSL). • SPJ footings of WTA and BMA (including foundation piles below the	Inspection, maintenance and repair of the SPJ facilities until final decommissioning: • included in Bass Strait Operations EP (AUGO-EV-EMM-002). Decommissioning preparation activities (i.e. air-gapping/flushing/cleaning): • included in Bass Strait Operations EP (AUGO-EV-EMM-002). Well P&A activities, including well conductor removal:

Included	Not included and where addressed
seabed) decommissioned in place – SPJs cut as close as practicable to the seabed (without large scale dredging). Proposed options to dispose of removed sections: • removed sections are transported to an ORC for dismantling and onshore recycling/disposal • removed sections are placed adjacent to the lower sections of the SPJ remaining in place, entirely within the title area (option relevant for HLA, CBA, MKA, KFA, KFB, WKF, and FLA only due to water depth).	• platform-based P&A included in Bass Strait Operations EP (AUGO-EV-EMM-002) • Jack Up Rig (JUR) or Mobile Offshore Drilling Unit (MODU) based P&A campaigns are subject to separate EP submission(s). The following decommissioning execution activities - which will be included in the future Campaign #1– End State Execution EP/s: • removal of PCA and DPA monotower facilities • removal of SPJ topsides for onshore dismantling and disposal/recycling • cutting and lifting of SPJ sections and removal from the title area or placement on the seabed adjacent to the lower sections of the SPJs • execution of post-decommissioning monitoring • details of proposed arrangements in relation to Section 270(3e) and (3f) – Consent to Surrender Title of the OPGGS Act*. End states for other property within the title areas: • pipelines, pipeline risers, umbilicals and subsea infrastructure • CGS platforms • debris associated with and in close proximity to facilities being decommissioned.

* Section 270(3)(e) and (3)(f) of the OPGGS Act requires that the titleholder has provided, to the satisfaction of NOPSEMA, for the conservation and protection of the natural resources in the surrender area; and made good any damage to the seabed or subsoil in the surrender area caused by any person engaged or concerned in the operations authorised by the permit, lease or licence.

This EP will end upon:

- acceptance of the Campaign #1 – End State Execution EP/s, which will be the permissioning document for the activities to execute the end state concepts proposed in this EP. The obligations under this EP (for example the Environmental Performance Standards (EPSs) and Environmental Performance Outcomes (EPOs) as included in Section 10) which are still applicable will be transferred to the Campaign #1 – End State Execution EP/s.
- submission and acceptance of the notifications as required under Regulation 29 (end of activity) and Regulation 25A (end of EP) of the OPGGS (Environment) Regulations.

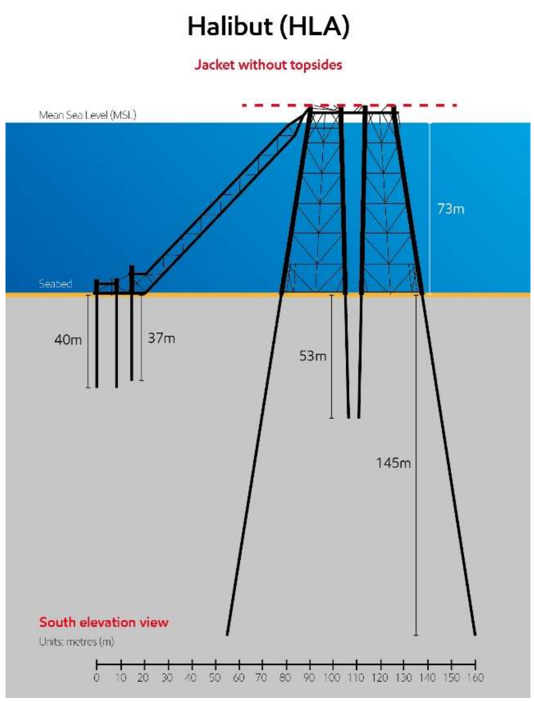
Hence this is not the last EP to be submitted for the petroleum titles listed in Appendix A1.

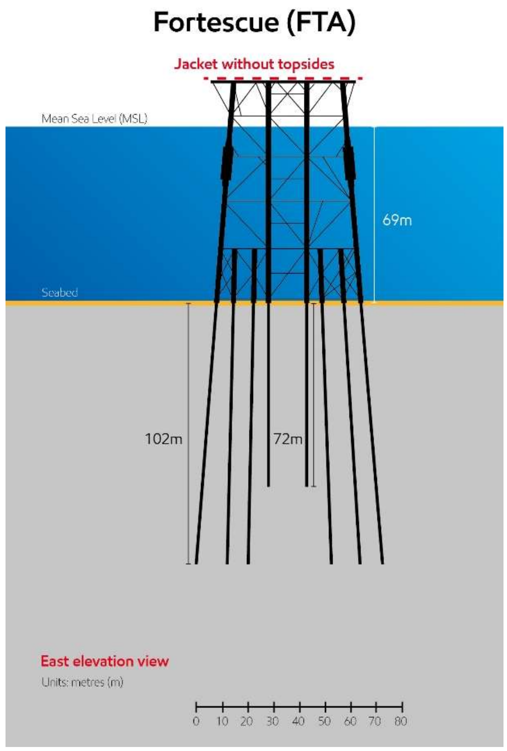
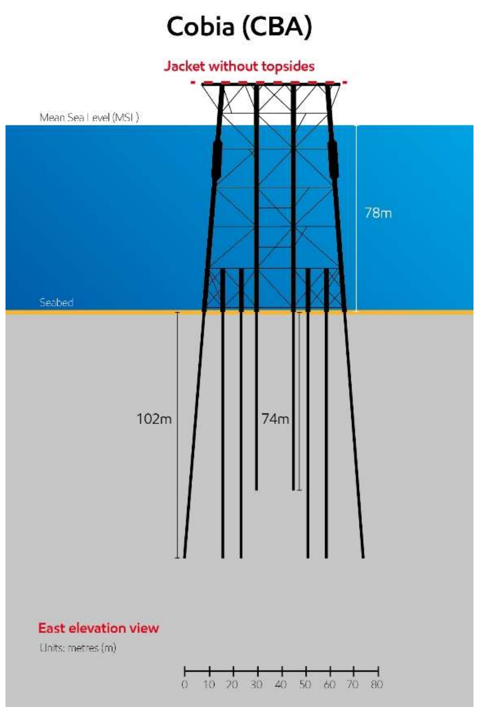
1.2.1 Property within the scope of this Environment Plan

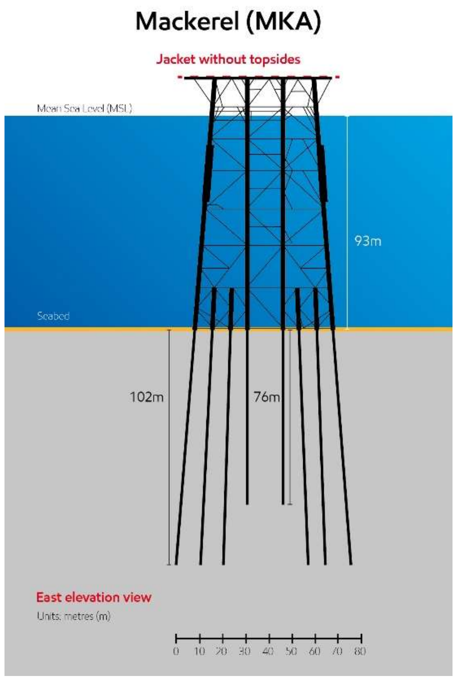
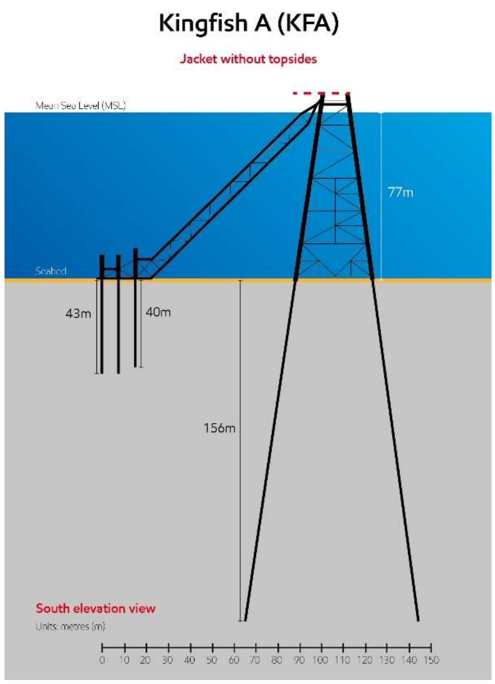
A summary of the Esso Bass Strait property within the scope of this EP is provided in Table 1-2. The images in Table 1-2 depict the SPJ facilities without the topsides and prior to any cutting and removal of the jacket substructure.

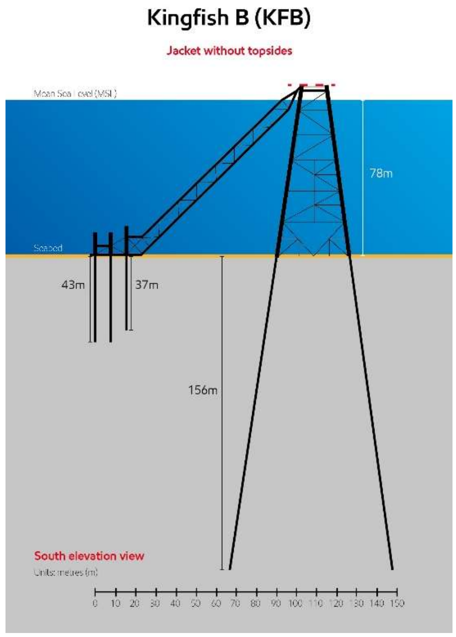
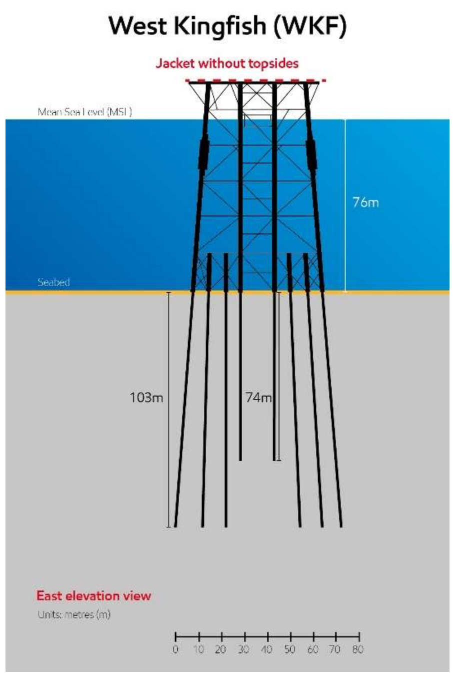
A detailed inventory of property within the scope of this EP has been included in Appendix A1.

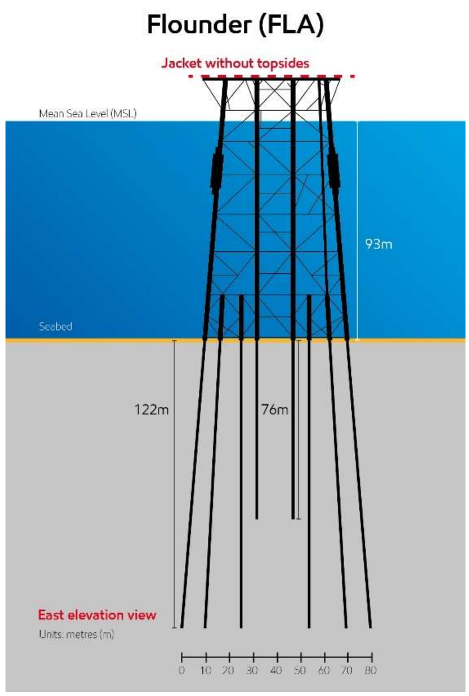
Table 1-2 Esso Bass Strait property in scope of this Environment Plan

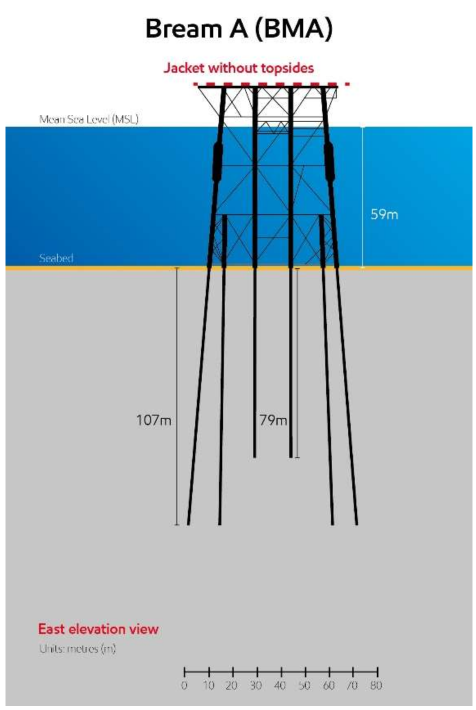
Facility		Property overview
Halibut (HLA) 		HLA was installed in 1968 and is located in 73m of water, 63km offshore from the Victorian coastline. The 16-leg SPJ at HLA includes a supporting steel strut to the west of the facility and steel piles extending to 145m below the seabed.

Facility		Property overview
Fortescue (FTA) 		FTA was installed in 1982 and is located in 69m of water, 62km offshore from the Victorian coastline. The eight-leg SPJ at FTA includes steel piles extending to 102m below the seabed.
Cobia (CBA) 		CBA was installed in 1982 and is located in 78m of water, 68km offshore from the Victorian coastline. The eight-leg SPJ at CBA includes steel piles extending to 102m below the seabed.

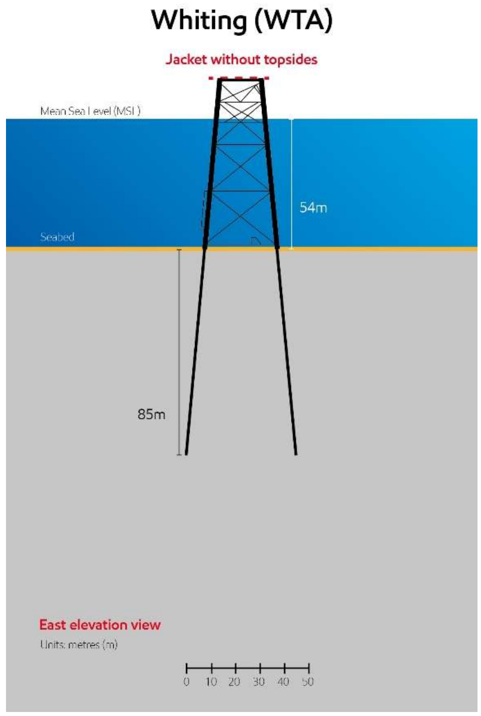
Facility		Property overview
Mackerel (MKA) 		MKA was installed in 1976 and is located in 93m of water, 72km offshore from the Victorian coastline. The eight-leg SPJ at MKA includes steel piles extending to 102m below the seabed.
Kingfish A (KFA) 		KFA was installed in 1969 and is located in 77m of water, 75km offshore from the Victorian coastline. The eight-leg SPJ at KFA includes a supporting strut and steel piles extending to 156m below the seabed.

Facility		**Property overview**
Kingfish B (KFB) 		KFB was installed in 1969 and is located in 78m of water, 77km offshore from the Victorian coastline. The eight-leg SPJ at KFB includes a supporting strut and steel piles extending to 155m below the seabed.
West Kingfish (WKF) 		WKF was installed in 1981 and is located in 76m of water, 72km offshore from the Victorian coastline. The eight-leg SPJ at WKF includes steel piles extending to 103m below the seabed.

<table>
<tr><th colspan="2">Facility</th><th>Property overview</th></tr>
<tr><td>Flounder (FLA)
</td><td>
</td><td>FLA was installed in 1983 and is located in 93m of water, 58km from the Victorian coastline.

The eight-leg SPJ at FLA includes steels piles extending to 122m below the seabed.</td></tr>
<tr><td>Bream A (BMA)
</td><td>
</td><td>BMA was installed in 1987 and is located in 59m of water, 46km from the Victorian coastline.

The eight-leg SPJ at BMA includes steel piles extending to 107m below the seabed.</td></tr>
</table>

Facility		Property overview
Whiting (WTA) 		WTA was installed in 1989 and is located in 54m of water, 34km from the Victorian coastline. The four-leg SPJ at WTA includes steel piles extending to 85m below the seabed.

1.2.2 Steel Piled Jacket platform description

SPJ platforms have a substructure (or jacket) that is fastened to the seabed by piles, as shown in Figure 1-1 (Bull & Love, 2019). These jackets support the ‘topsides’, which contain the production facilities, living quarters, and a helicopter landing pad. Supporting piles are driven through the legs of the SPJ deep into the seabed to keep the structure in place, while the SPJ is braced by a complex array of horizontal, vertical and oblique crossbeams extending around the perimeter and inside and across the jacket (Bull & Love, 2019). A supporting ‘strut’ is also on place on some SPJs (KFA, KFB and HLA) to provide additional support.

A 70-metre jacket structure is analogous to the height of a more than 20-story building on land (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2022).

Figure 1-2 and Figure 1-3 provide historical imagery of the Bass Strait SPJs prior to their installation.

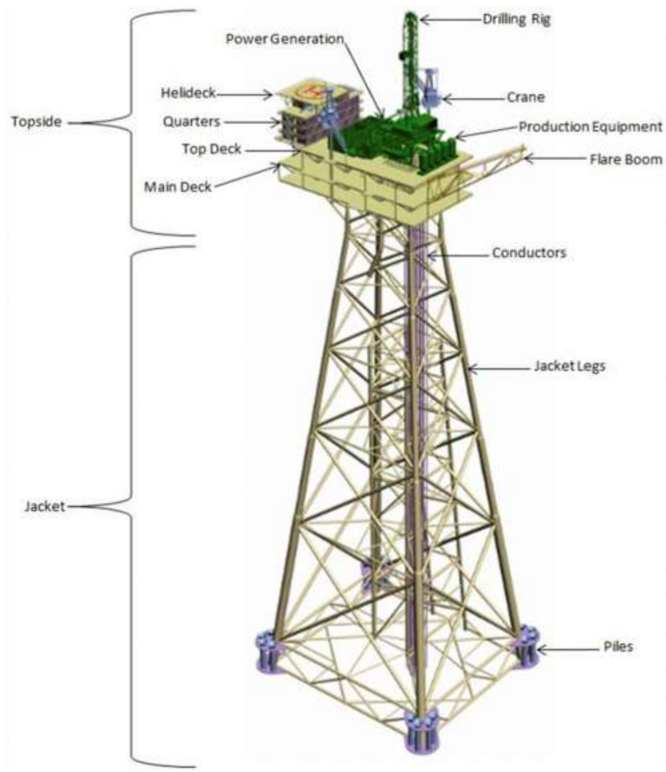


Figure 1-1 Diagram of a typical Steel Piled Jacket platform

Figure 1-2 One of the Kingfish Steel Piled Jackets being transported to its installation location

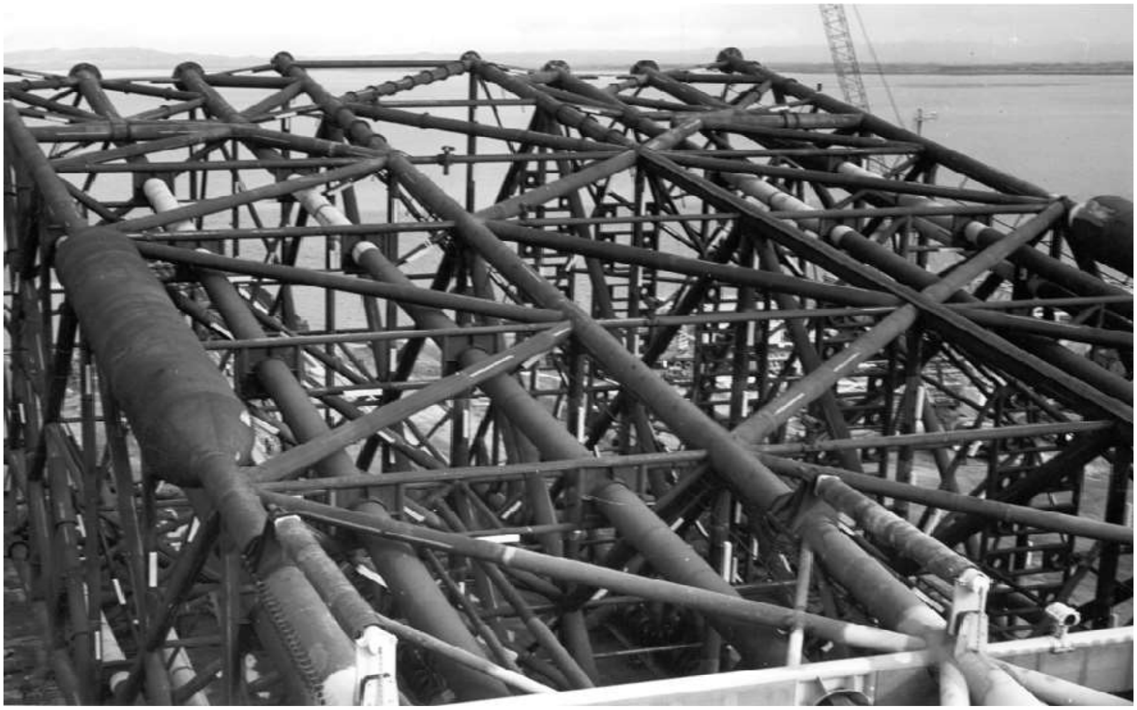


Figure 1-3 The Mackerel Steel Piled Jacket prior to installation, showing the complexity of the structure

1.2.3 Life cycle of a facility

A titleholder may determine what is involved in a particular stage of a petroleum activity and provide adequately for those activities in an EP. As defined in *When to submit a proposed revision of an EP* (NOPSEMA, 2020d), a new stage of activity is defined as a change to the spatial or temporal limits of the petroleum activity described in the accepted EP.

The life cycle stages of the Bass Strait SPJs are shown in Figure 1-4 and Table 1-3.

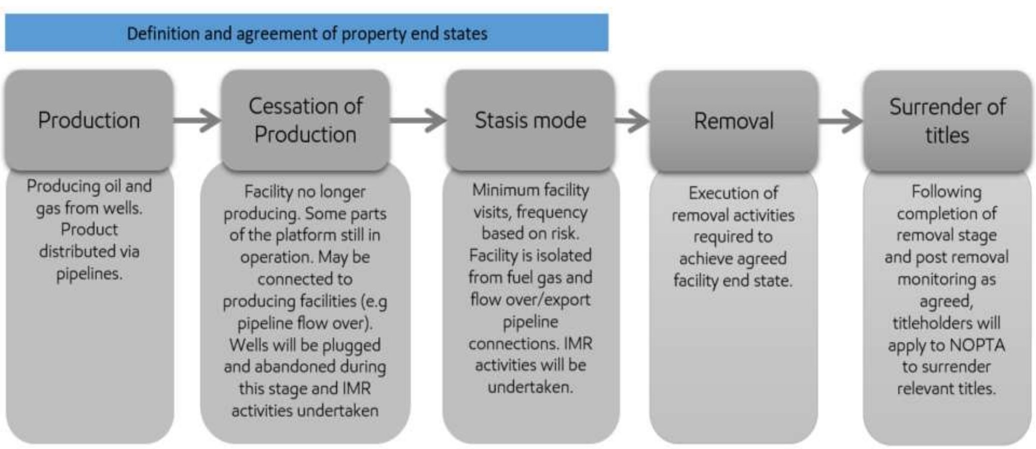


Figure 1-4 Life cycle stages of the Bass Strait facilities

The 10 Campaign #1 SPJs included in this EP are currently either in the Production or Cessation of Production (CoP) life cycle stage (refer to Appendix A1 of this EP for the SPJ status).

Physical activities associated with the Production, CoP and Stasis Mode stages are outside the scope of this EP. These stages are included in the Bass Strait Operations EP (AUGO-EV-EMM-002).

Following the execution of decommissioning activities to achieve the agreed end states and the undertaking of post-decommissioning monitoring as appropriate and agreed with NOPSEMA, the titleholders will apply to the National Offshore Petroleum Titles Administrator (NOPTA) to surrender the relevant petroleum titles. Hence the ‘Removal’ and ‘Surrender of Title’ stages of the facility life cycle are also not within the scope of this EP. These stages will be included in the future Campaign #1 – End State Execution EP/s submission.

Table 1-3 Bass Strait facility life cycle stages

Stage	Definition	Activities within the scope of this EP
Production	Facility is producing oil and gas which is distributed via pipelines. In some instances during this stage, production may temporarily be ceased while future development plans are being evaluated. A facility will move to the CoP stage when production has ceased and there is no intention of returning to production in the future.	**Agreement on end states for the HLA, CBA and WKF SPJs – Yes** Other activities - No
Cessation of Production	Key change from prior stage – CoP stage commences when a facility is no longer producing oil and gas wells are shut-in. There are a number of activities within the CoP stage: • Care and Preservation (C&P) activities pre well P&A: ○ systems are being maintained and/or preserved where they are required for future P&A and decommissioning activities and/or to facilitate upstream asset ongoing production ○ wells continue to be monitored as per the Wells Integrity Management System (WIMS) and risk assessments undertaken as required prior to P&A. Wells may be plugged and secured (P&S) using a wireline rig to preserve wellbore integrity for the period prior to P&A. Once platforms are temporarily de-staffed, periodic platform visits are conducted as required to complete operations and maintenance tasks (e.g. WIMS testing, well operations, restart equipment that has shut down, top up lube oils, launch/receive pigs, re-establish communications) to facilitate upstream platform operations and/or maintain equipment for future decommissioning activities. Platform visits may be conducted as day trips, or by re-staffing the facility for a period of time (could be weeks/months). • Well P&A and well conductor removal: ○ wells will be P&A'd during the CoP stage. Timing of P&A is dependent on the risk profile of the well ○ well conductors will be removed either post-P&A or as part of the Removal stage ○ some systems on the platform are still in operation with temporary or permanent connections (e.g. power, air, safety systems, fuel systems, pig launcher/receivers, cathodic protection, etc.). • C&P post-well P&A (as applicable):	**Agreement on end states for SPJs in CoP - Yes** Other activities - No

Stage	Definition	Activities within the scope of this EP
	○ Platforms are normally de-staffed, with platform visits conducted as required to complete operations and maintenance tasks (e.g. restart equipment that has shut down, top up lube oils, launch/receive pigs, re-establish communications) to facilitate upstream platform operations and/or maintain equipment for future decommissioning activities. Platform visits may be conducted as day trips, or by temporarily re-staffing the facility for a period of time (could be weeks/months). • Facility preparation for removal: ○ activities are being undertaken to prepare the platform for removal in parallel with Inspection Maintenance and Repair (IMR) to preserve the facility for the Stasis Mode stage ○ facilities will be progressively isolated from fuel gas and flow-over/export pipeline connections. The overall duration of CoP is dependent on current and potential future use requirements of the facility. Due to the high level of interconnectedness of the Bass Strait facilities, some platforms continue to be used to facilitate pipeline ‘flow over’ to or from producing facilities. Some platform systems will also be used to facilitate the preparation of other facilities for decommissioning such as the flushing of pipelines and umbilicals, and removal of topsides hydrocarbons. At completion of C&P the facility will have completed P&A and facility preparation and can be put into Stasis Mode.	**Agreement on end states for SPJs in CoP - Yes** Other activities – No
Stasis Mode	Key change from prior stage: • activities to prepare facility for a period of minimal activity and removal are complete • facilities are isolated from fuel gas and flow-over/export pipeline connections • facilities are considered to be ‘not in use, nor to be used’ in connection with the operations (per Section 572 of the OPGGS Act) when Stasis Mode stage is reached • facility is ready for removal. The duration for which a platform will remain in the Stasis Mode stage is dependent on the current and future use requirements (i.e. to facilitate preparation for removal of other facilities) of the facility and the timing of decommissioning campaigns. Platform visits may be undertaken to complete IMR activities to maintain platform prior to future removal.	No

Stage	Definition	Activities within the scope of this EP
Removal	Removal execution activities required to achieve the agreed facilities end state. Removal activities will be undertaken by specialised third party contractors with the appropriate vessels, equipment and expertise to undertake this work.	No
Surrender of Titles	Following the completion of decommissioning and post-decommissioning monitoring, as appropriate and agreed with NOPSEMA, the titleholders will apply to NOPTA to surrender the relevant petroleum titles.	No

1.3 Decommissioning timeline

The decommissioning timeline is being managed to ensure all regulatory permissioning documents are in place to enable commencement of Campaign #1 in accordance with the requirements of General Direction #817 (refer Section 2.1.1.1). Figure 1-5 is an indicative timeline for the key decommissioning milestones.

This EP is the first of the permissioning documents required for decommissioning the SPJs. A Campaign #1 – End State Execution EP (or EPs) will subsequently be submitted to NOPSEMA for assessment before work commences, following agreement of SPJ end state concepts with NOPSEMA (via a decision on this EP). In addition to the environmental approval requirements required under the OPGGS Act, Esso is actively working to obtain other Commonwealth and State regulatory approvals to meet the General Direction #817 requirement to commence topsides dismantling of the facilities listed in Schedule 3 of General Direction #817[1] as soon as reasonably practicable and no later than 2027.

[1] The facilities listed in Schedule 3 of GD#817 are WTA, MKA, FTA, KFA, KFB, FLA, BMA, BMB, DPA and PCA.

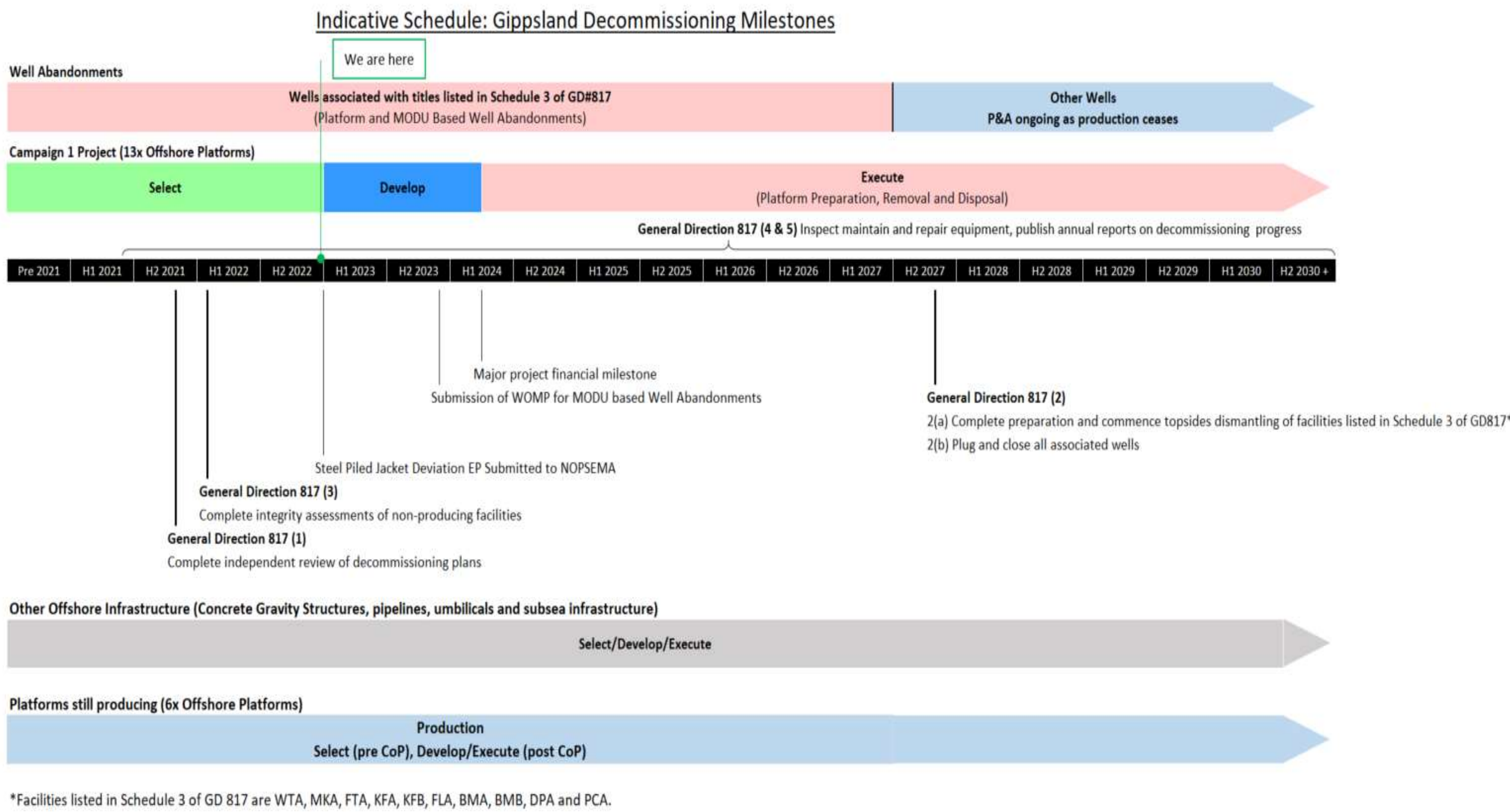


Figure 1-5 Indicative decommissioning timeline

The facilities included in Campaign #1, inclusive of all platforms and pipelines, are shown in Figure 1-6. The scope of this EP only covers the SPJs as defined in Table 1-2. These are circled with pink dots in Figure 1-6 and further described in Section 2.1.1.1.

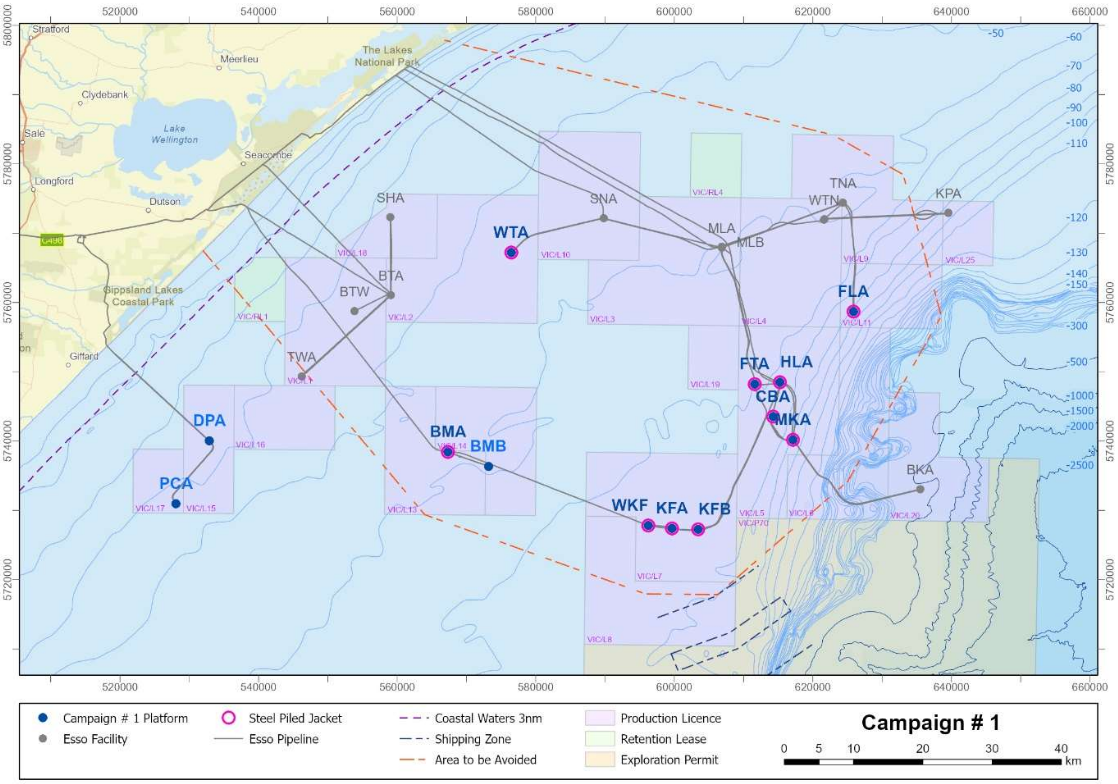


Figure 1-6 Campaign #1 facilities

1.4 Operational Area

The Operational Area (OA) is defined as the geographical spatial area in which the impacts and potential risks as a result of the proposed SPJ end states are addressed by this EP (noting there are no 'operations' nor execution activities as part of this EP). This includes the SPJs and a radius of 500 metres in all directions from each of the SPJ locations (a 1000-metre diameter). Hence there are 10 discrete OAs within this EP. This is discussed further in Section 4.3.

1.5 Structure of the Environment Plan

This EP has been structured in accordance with the requirements of the OPGGS (Environment) Regulations, as outlined in Table 1-4.

Table 1-4 Environment Plan process phases, applicable OPGGS (Environment) Regulations and relevant sections of this Environment Plan

Criteria for acceptance	Content requirements	Elements	Section of EP
Regulation 10A(a): *is appropriate for the nature and scale of the activity*	Regulation 13: Environmental assessment Regulation 14: Implementation strategy for the environment plan Regulation 16: Other information in the environment plan	• The principle of 'nature and scale' is applicable throughout the EP.	All sections
Regulation 10A(b): *demonstrates that the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable* Regulation 10A(c): *demonstrates that the environmental impacts and risks of the activity will be of an acceptable level*	Regulation 13(1) – 13(7): • 13(1) Description of the activity • 13(2)(3) Description of the environment • 13(4) Requirements • 13(5)(6) Evaluation of environmental impacts and risks • 13(7) Environmental performance outcomes and standards. Regulation 16(a) – 16(b): • 16(a) a statement of the titleholder's corporate environmental policy • 16(b) a report on all consultations under regulation 11A of any relevant person by the titleholder.	• Set the context (the activity, the environment) • Define 'acceptable' (the requirements, the corporate policy, relevant persons) • Detail the impacts and risks • Evaluate nature and scale (consider public comments) • Detail the control measures - As low as reasonably practicable (ALARP) and acceptable (consider public comments).	Section 4 Section 5 Section 6 Section 7 Section 8 Section 9 Section 10 Appendix B Appendix C1 Appendix C2
Regulation 10A(d): *provides for appropriate environmental performance outcomes, environmental*	Regulation 13(7) Environmental performance outcomes and standards	• Environmental performance outcomes • Environmental performance standards	Section 10

Criteria for acceptance	Content requirements	Elements	Section of EP
performance standards and measurement criteria		• Measurement criteria.	
Regulation 10A(e): *includes an appropriate implementation strategy and monitoring, recording and reporting arrangements*	Regulation 14: Implementation strategy for the environment plan	• Implementation strategy, including: • Monitoring arrangements for infrastructure remaining in place • Ongoing relevant person consultation.	Section 6 Section 11
Regulation 10A(f): *does not involve the activity or part of the activity, other than arrangements for environmental monitoring or for responding to an emergency, being undertaken in any part of a declared World Heritage property within the meaning of the EPBC Act*	Regulation 13(1), 13(2), 13(3): • 13(1) Description of the activity • 13(2) Description of the environment • 13(3) Without limiting [Regulation 13(2)(b)], particular relevant values and sensitivities may include any of the following: ○ (a) the world heritage values of a declared World Heritage property within the meaning of the EPBC Act; ○ (b) the national heritage values of a National Heritage place within the meaning of that Act ○ (c) the ecological character of a declared Ramsar wetland within the meaning of that Act ○ (d) the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act ○ (e) the presence of a listed migratory species within the meaning of that Act ○ (f) any values and sensitivities that exist in, or in relation to, part or all of:	• No activity or part of the activity, undertaken in any part of a declared World Heritage property.	Section 4 Section 5

Criteria for acceptance	Content requirements	Elements	Section of EP
	○ (i) a Commonwealth marine area within the meaning of that Act; or ○ (ii) Commonwealth land within the meaning of that Act.		
Regulation 10A(g): *(i) the titleholder has carried out the consultations required by Division 2.2A; and* *(ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate*	• Regulation 11A: Consultation with relevant authorities, persons and organisations, etc. ○ Regulation 16(b): A report on all consultations under regulation 11A of any relevant person by the titleholder	• Consultation in preparation of the EP.	Section 6 Appendix C1
Regulation 10A(h): *complies with the Act and the regulations*	Regulation 15(1) and 15(2): Details of titleholder and liaison person Regulation 15(3): Arrangements for notifying the Regulator of a change in titleholder, a change in the titleholders nominated liaison person or a change in the contact details for either the titleholder of the liaison person. Regulation 16(c): details of all reportable incidents in relation to the proposed activity.	• All content of the EP must comply with the Act and its associated regulations.	Section 0 Section 11

1.6 Titleholder details

Esso, a wholly owned subsidiary of ExxonMobil Australia Pty Ltd, is the operator for the Gippsland Basin Joint Venture (GBJV) (Esso and Woodside Energy (Bass Strait) Pty Ltd). Esso receives services, including personnel, from its wholly owned subsidiary, Esso Australia Pty Ltd (EAPL), which is also a wholly owned subsidiary of ExxonMobil Australia Pty Ltd.

Petroleum Production Licences applicable to this EP are listed in Appendix A1.

The nominated registered office for the proponent is:

Esso Australia Resources Pty Ltd (ACN 091 829 819)

Level 9, 664 Collins Street, Docklands VIC 3008

The environmental contact for this activity is:

Louise Mayboehm, Decommissioning Safety, Security, Health & Environment Lead

EAPL for and on behalf of Esso

Telephone: (03) 9261 0000

Email: eapl.regulatory@exxonmobil.com

NOPSEMA will be notified of a change in titleholder, a change in the environmental contact or a change in the contact details for either the titleholder or the environmental contact in accordance with Regulation 15(3) of the OPGGS (Environment) Regulations.

2 Legislative and other requirements

This Section describes the Commonwealth legislation, international agreements and guidance and industry guidelines relevant to this EP.

The OAs for the EP are located entirely within Commonwealth waters. Legislation relating to vessel operations and spill response have not been included, as vessel operations are not within the scope of this EP and there is no credible spill scenario associated with this EP.

2.1 Key Commonwealth legislation

2.1.1 Offshore Petroleum and Greenhouse Gas Storage Act 2006 and regulations

The OPGGS Act and associated regulations provide the legal framework for offshore petroleum exploration and recovery operations in Commonwealth waters (areas extending beyond the three nautical mile limit). The OPGGS (Environment) Regulations relate specifically to environmental management. The objective is to ensure that any petroleum activity carried out in an offshore area is:

- carried out in a manner consistent with the principles of ecologically sustainable development set out in Section 3A of the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act)
- carried out in a manner by which the environmental impacts and risks of the activity will be reduced to ALARP
- carried out in a manner by which the environmental impacts and risks of the activity will be of an acceptable level.

The OPGGS (Environment) Regulations provide eight acceptance criteria that NOPSEMA must assess an EP against. The EP must:

- be appropriate for the nature and scale of the activity
- demonstrate that the environmental impacts and risks of the activity will be reduced to ALARP
- demonstrate that the environmental impacts and risks of the activity will be of an acceptable level
- provide for appropriate EPOs, EPSs and measurement criteria
- include an appropriate implementation strategy
- ensure that the activity does not occur in a World Heritage property (with the exception of environmental monitoring or responding to an emergency)
- demonstrate that appropriate consultation has been, and will continue to be, undertaken
- complies with the OPGGS Act and its associated regulations.

The OPGGS Act and associated regulations address licensing, health, safety and environmental matters for offshore petroleum activities in Commonwealth waters and are administered by the NOPSEMA. Obligations in relation to the removal of property brought onto a title are provided in OPGGS Act Section 572. In accordance with Section 572(3) of the OPGGS Act a titleholder must remove from the title area all structures that are, and all equipment and other property that is neither used nor to be used in connection with the operations.

Under Section 572(7) of the OPGGS Act the obligation to remove all property is subject to other provisions of the OPGGS Act and its associated regulations, directions and other applicable laws. Deviations from the property removal requirement of Section 572(3) may be agreed to by NOPSEMA through permissioning documents such as an EP. As stated in the Australian Government Decommissioning Guideline, issued February 2022 (see Section 2.4.1), this requires demonstration that a proposed deviation option delivers equal or better environmental outcomes compared to complete removal and meets all applicable requirements under the OPGGS Act and its associated regulations, including well integrity and safety-related matters, and other applicable laws.

Per Section 270(3) of the OPGGS Act, an application can be made to the Joint Authority to surrender a title (i.e. a production licence) once the titleholder(s) have:

- paid all applicable fees, royalties and levies
- fully complied with the conditions of the title
- complied with all relevant provisions under the OPGGS Act (including submission of reports and data that are due)
- to the satisfaction of NOPSEMA:
- removed all property (or made other arrangements that are satisfactory to NOPSEMA) from the area
- plugged or closed off any wells
- provided for the conservation and protection of the natural resources in the area
- made good any damage to the seabed or subsoil.

Addressing the requirements of Section 270 is not within the scope of this EP and will be subject to inclusion in the future Campaign #1 – End State Execution EP/s submission, and subsequent EPs if required.

2.1.1.1 General Direction #817

General Direction #817 made under Section 574 of the OPGGS Act, was issued to Esso and BHP (now Woodside Energy (Bass Strait) Pty Ltd) on 20 May 2021. A detailed implementation plan was subsequently submitted to NOPSEMA in August 2021, outlining Esso's approach to ensuring compliance with this General Direction, which relates to decommissioning. Quarterly meetings are held between Esso and NOPSEMA to measure progress against this implementation plan.

An annual decommissioning report detailing progress with implementing the requirements of General Direction #817 is also submitted to NOPSEMA in December each year and published on the Esso website. This report should be referred to for current details on progress against General Direction #817 requirements.

The requirements of General Direction #817 and how they relate to this EP have been summarised in Table 2-1.

Table 2-1 General Direction #817 requirements

Direction	Action required	Relevance to this EP
1a, b and c	Commission, and submit to NOPSEMA, an independent review of the engineering and project management approach to decommissioning activities to identify opportunities and propose measures to reduce the timeframe for commencing and completing all decommissioning activities. Implement reasonable and practicable measures based on this review.	N/A – review completed and submitted to NOPSEMA on 16 November 2021 and was accepted by NOPSEMA on 8 December 2021.
2a	Complete all preparatory decommissioning activities and commence the topside dismantling campaign as soon as reasonably practicable, and no later than 30 September 2027, for removal of all structures, property and equipment no longer in use associated with facilities listed in Schedule 3[1] of the Direction.	Facilities listed in Schedule 3 of the Direction are included within the scope of this EP (where an end state is proposed for an SPJ that is not complete removal). The submission of this EP is a key activity to enable the scope of Campaign #1 to be defined for removal contracting.
2b	To plug or close, to the satisfaction of NOPSEMA, all wells associated with the titles listed in Schedule 3, as soon as reasonably practicable and no later than 30 September 2027.	N/A. Well P&A activities utilising platform-based rigs is addressed in the Bass Strait Operations EP (AUGO-EV-EMM-002). Well P&A activity utilising JURs or MODUs are subject to activity specific EP submissions.
3 a and b	Conduct, and submit to NOPSEMA, an integrity assessment of the Perch and Dolphin facilities to demonstrate that their full removal will not be precluded.	N/A Integrity assessment was submitted to NOPSEMA on 16 August 2021 and was accepted on 28 September 2021.
3 c and d	Conduct, and submit to NOPSEMA, integrity assessments of all equipment structures and property that are in a non-producing state, to demonstrate that full removal of structures, property and equipment will not be precluded.	N/A Integrity assessments were submitted to NOPSEMA on 31 January 2022 and were accepted by NOPSEMA on 10 March 2022.
4	Undertake inspection, maintenance and repair activities on all property and wells associated with facilities listed in Schedule 3 of the Direction to ensure: • Property continues to perform its intended function	N/A IMR activities for facilities listed in Schedule 3 are described in the Bass Strait Operations EP (AUGO-EV-EMM-002). Property continues to be maintained so as not to

Direction	Action required	Relevance to this EP
	• Approved decommissioning end states are not precluded • Occupational health and safety, structural integrity and environmental risks continue to be reduced to ALARP.	preclude its proposed end state and full removal (in the event deviation from full removal is not accepted).
5	Submit a decommissioning progress report to NOPSEMA on an annual basis no later than 31 December each year outlining progress with implementing the General Direction requirements. Report to be published on the Esso website.	N/A The 2021 Annual Bass Strait Operations Decommissioning Report 2021 was accepted by NOPSEMA on 1 March 2022 and published on the Esso website on 3 March 2022. As per the obligation under GD#817, Esso will submit and gain acceptance from NOPSEMA of decommissioning annual reports and publish these on the Esso website each year.

Note 1: The facilities listed in Schedule 3 of GD#817 are WTA, MKA, FTA, KFA, KFB, FLA, BMA, BMB, DPA and PCA.

2.1.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. These are defined in the EPBC Act as matters of national environmental significance (MNES). The EPBC Act is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

In 2014, offshore petroleum activity environmental approvals were streamlined. As a result, petroleum activities that have been assessed and approved by NOPSEMA under the OPGGS Act do not need to be separately assessed under the EPBC Act.

Statutory recovery plans and threat abatement plans for threatened species listed under Part 3 of the EPBC Act are relevant requirements for this EP. These have been outlined in Section 5 of this EP.

2.1.3 Environment Protection (Sea Dumping) Act 1981

The *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act) regulates the disposal of wastes (loading, dumping, and incineration) at sea, and the creation of artificial reefs and applies to all vessels, aircraft and platforms in Australian waters. The definition of ‘dumping’ includes the abandonment or toppling at sea of platforms or other manmade structures for the sole purpose of deliberate disposal.

The Sea Dumping Act aims to fulfil Australia’s international obligations under the London Convention/Protocol (refer to Section 2.2.2). If platforms, equipment or other structures are proposed to be decommissioned partially or fully in place, disposed of at another site or used to create an artificial reef, a Sea Dumping Permit is required.

Esso has undertaken detailed discussions with DCCEEW as to the applicability of the Sea Dumping Act to the proposed SPJ end states. DCCEEW have confirmed that Sea Dumping Permit(s) are required for the proposed end states for the SPJs. Permit applications are being progressed.

2.1.4 Native Title Act 1993

The *Native Title Act 1993* (Native Title Act) recognises the rights and interests of Aboriginal and Torres Strait Islander people in land and waters according to their traditional laws and customs and provides recognition and protection of native title. Native title holders and registered native title claimants (native title parties) have procedural rights over project proposals which may affect their native title (future acts). Native title applications are applications made to the Federal Court under the Native Title Act for a determination, or decision about native title in a particular area. There are no known native title claims in the 10 OAs relevant to this EP.

2.1.5 Underwater Cultural Heritage Act 2018

The *Underwater Cultural Heritage Act 2018* provides for the protection of Australia's shipwrecks, and has broadened protection to sunken aircraft and other types of underwater cultural heritage including Australia's Aboriginal and Torres Strait Islander Underwater Cultural Heritage in Commonwealth waters. Projects that damage or interfere with a historic shipwreck or relic in Australian waters or with a submerged aircraft or associated artefacts in Commonwealth waters requires a permit. DCCEEW administers the Underwater Cultural Heritage Act. There are no known shipwrecks, relics, submerged aircraft or associated artifacts in the OAs relevant to this EP.

2.1.6 Federal Court Decisions 2022

On the 21 September 2022, the Federal Court of Australia ruled in the *Tipakalippa vs NOPSEMA (No 2 [2022] FCA 1121* case to set aside NOPSEMAs decision to accept an EP (the Santos Barossa Development Drilling and Completions EP) on the basis NOPSEMA could not be reasonably satisfied that the EP met the criteria specified in the OPGGS (Environment) Regulations. This ruling specifically related to the undertaking of relevant person consultation, as required by Regulation 11A. A subsequent appeal to this decision, *Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193,* was dismissed by the Federal Court on the 2 December 2022. From this date, the appeal decision represents the law regarding requirements for consultation in accordance with the Environment Regulations. Following the Federal Court decisions, NOPSEMA has developed a guideline for industry "Consultation in the course of preparing an environment plan" Document No. N-04750-GL2086 A900179, dated 15/12/2022. This guideline and the appeal decision have informed the preparation of this EP.

2.2 International agreements and guidance

2.2.1 United Nations Convention on the Law of the Sea 1982

The United Nations Convention on the Law of the Sea 1982 (UNCLOS) is a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all users of the oceans and their resources by maintaining order, productivity, and peaceful relations on the sea. Australia participated in all three United Nations conferences on the Law of the Sea (1958, 1960 and 1973-82) and became party (or a 'member state') to UNCLOS in 1994.

Article 60 of UNCLOS prescribes that 'any installations or structures which are abandoned or disused must be removed'.

Guidance in relation to Article 60 of UNCLOS was adopted by the International Maritime Organisation (IMO) in 1989 (IMO Res. A.672(16), 1989). The guidance states that 'abandoned or disused offshore installations or structures are required to be removed, except where non removal or partial removal is consistent with the following guidelines and standards'.

Matters which should be taken into account by member states when deciding on a case-by-case basis if infrastructure should be fully or partially removed include:

- potential effects on safety of navigation and the environment, the potential rate of deterioration of materials and/or the risk infrastructure will shift in the future
- costs, technical feasibility and risk of injury to personnel of removal of the infrastructure
- determination of a new use, or any other reasonable justification for allowing the infrastructure to remain on the seabed.

The IMO guidance (IMO Res. A.672(16), 1989) also includes Standards relating to the consideration of full or partial removal of infrastructure. In summary:

- complete removal required for all structures in less than 75 metres of water that weigh less than 4000 tonnes (excluding deck and superstructure)
- complete removal required for all structures in less than 100 metres of water installed after January 1998 and weighing less than 4000 tonnes
- if partially removed, an unobstructed water column of at least 55 metres should be provided for all structures which do not project above the sea surface
- member states may determine that infrastructure may be left in place if it will serve a new use (i.e. enhancing a living resource) or will not cause unjustifiable interference to other users of the sea
- notwithstanding these requirements, if entire removal is not technically feasible, will involve extreme cost or result in unacceptable risk to personnel or the marine environment, the member state may determine that infrastructure need not be fully removed.

An assessment of the proposed SPJ end states against the IMO guidance (IMO Res. A.672(16), 1989) is provided in Table 2-2.

Table 2-2 Proposed Steel Piled Jacket end states: Assessment against IMO Resolution A672 (16)

<table>
<tr><th colspan="2" rowspan="3">Guideline or Standard</th><th colspan="10">Facility and proposed end state</th></tr>
<tr><th>Halibut (HLA)</th><th>Kingfish A (KFA)</th><th>Kingfish B (KFB)</th><th>Mackerel (MKA)</th><th>West Kingfish (WKF)</th><th>Cobia (CBA)</th><th>Flounder (FLA)</th><th>Fortescue (FTA)</th><th>Bream A (BMA)</th><th>Whiting (WTA)</th></tr>
<tr><th colspan="8">Lower section of SPJs (including foundation piles and strut footings where applicable) decommissioned in place – cut to ensure minimum 55m clearance</th><th colspan="2">SPJ footings decommissioned in place – cut as close as practicable to the seabed (without large scale dredging)</th></tr>
<tr><td>1.1</td><td>Abandoned or disused offshore installations or structures on any continental shelf or in any exclusive economic zone are required to be removed, except where non-removal or partial removal is consistent with the following guidelines and standards.</td><td colspan="10">Noted.</td></tr>
<tr><td rowspan="7">2.1</td><td>The decision to allow an offshore installation, structure, or parts thereof, to remain on the seabed should be based, in particular, on a case-by-case evaluation, by the coastal State with jurisdiction over the installation or structure, of the following matters:</td><td colspan="8"></td><td colspan="2"></td></tr>
<tr><td>• any potential effect on the safety of surface or subsurface navigation, or of other uses of the sea;</td><td colspan="8">Given effect through consistency with Standard 3.6 (an unobstructed water column sufficient to ensure safety of navigation, but not <55m, should be provided above any partially removed installation or structure which does not project above the surface of the sea).</td><td colspan="2">Impacts and risks to other users of the sea have been discussed in Sections 8.3 and 9.3 of this EP.</td></tr>
<tr><td>• the rate of deterioration of the material and its present and possible future effect on the marine environment;</td><td colspan="10">The degradation of SPJ materials is discussed and evaluated in Section 8.5 of this EP.</td></tr>
<tr><td>• the potential effect on the marine environment, including living resources;</td><td colspan="10">The impacts and risks of the proposed end states on the marine environment are discussed and evaluated in Section 8 and Section 9 of this EP.</td></tr>
<tr><td>• the risk that the material will shift from its position at some future time;</td><td colspan="10">The degradation of the SPJ materials and the predicted future position of the structures is discussed and evaluated in Section 8.5 of this EP.</td></tr>
<tr><td>• the costs, technical feasibility, and risks of injury to personnel associated with removal of the installation or structure; and</td><td colspan="10">Technical feasibility, cost and safety risks associated with the removal of the SPJs has been assessed in the Options Feasibility Assessment (Section 3 of this EP).</td></tr>
<tr><td>• the determination of a new use or other reasonable justification for allowing the installation or structure or parts thereof to remain on the seabed.</td><td colspan="10">Esso is actively investigating re-purposement options for the SPJs. However, until such time as viable re-use options are identified, planning for removal will continue.

A new use or reasonable justification for allowing parts of the SPJs to remain on the seabed is considered to be the ‘enhancement of a living resource’ – this being the ecosystems currently being supported by the SPJs.</td></tr>
</table>

Guideline or Standard		Facility and proposed end state									
		Halibut (HLA)	Kingfish A (KFA)	Kingfish B (KFB)	Mackerel (MKA)	West Kingfish (WKF)	Cobia (CBA)	Flounder (FLA)	Fortescue (FTA)	Bream A (BMA)	Whiting (WTA)
		Lower section of SPJs (including foundation piles and strut footings where applicable) decommissioned in place – cut to ensure minimum 55m clearance								SPJ footings decommissioned in place – cut as close as practicable to the seabed (without large scale dredging)	
2.2	The determination of any potential effect on safety of surface or subsurface navigation or of other uses of the sea should be based on: • the number, type and draught of vessels expected to transit the area in the foreseeable future; • the cargoes being carried in the area; • the tide, current, general hydrographic conditions and potentially extreme climatic conditions; • the proximity of designated or customary sea lanes and port access routes, the aids to navigation in the vicinity; • the location of commercial fishing areas; • the width of the available navigable fairway; and • whether the area is an approach to or in straits used for international navigation or routes used for international navigation through archipelagic waters.	Given effect through consistency with Standard 3.6 (an unobstructed water column sufficient to ensure safety of navigation, but not <55m, should be provided above any partially removed installation or structure which does not project above the surface of the sea).								Impacts and risks to other users of the sea have been discussed in Section 8 and Section 9 of this EP.	
2.3	The determination of any potential effect on the marine environment should be based upon scientific evidence taking into account: • the effect on water quality; • geological and hydrographic characteristics; • the presence of endangered or threatened species; • existing habitat types; • local fishery resources; and • the potential for pollution or contamination of the site by residual products from, or deterioration of, the offshore installation or structure.	The impacts and risks of the proposed end states on the marine environment are discussed and evaluated in Section 8 and Section 9 of this EP.									

Guideline or Standard		Facility and proposed end state									
		Halibut (HLA)	Kingfish A (KFA)	Kingfish B (KFB)	Mackerel (MKA)	West Kingfish (WKF)	Cobia (CBA)	Flounder (FLA)	Fortescue (FTA)	Bream A (BMA)	Whiting (WTA)
		Lower section of SPJs (including foundation piles and strut footings where applicable) decommissioned in place – cut to ensure minimum 55m clearance								SPJ footings decommissioned in place – cut as close as practicable to the seabed (without large scale dredging)	
2.4	The process for allowing an offshore installation or structure, or parts thereof, to remain on the seabed should also include the following actions by the coastal State with official authorization identifying the jurisdiction over the installation or structure: • special conditions under which an installation or structure, or parts thereof, will be allowed to remain on the seabed; • the drawing up of a specific plan, adopted by the coastal State, to monitor the accumulation and deterioration of material left on the seabed to ensure there is no subsequent adverse impact on navigation, other uses of the sea or the marine environment; • advance notice to mariners as to the specific position, dimensions, surveyed depth and markings of any installations or structures not entirely removed from the seabed; and • advance notice to appropriate hydrographic services to allow for timely revision of nautical charts.	The proposed monitoring arrangements for the infrastructure remaining in place is discussed in Section 11 of this EP. Advance notice to appropriate hydrographic services has been included as a control in Section 10 of this EP.									
3.1	All abandoned or disused installations or structures standing in less than 75 m of water and weighing less than 4,000 tonnes in air, excluding the deck and superstructure, should be entirely removed.	N/A HLA weight >4000t.	N/A KFA in water depth >75m.	N/A KFB in water depth >75m.	N/A MKA water depth >75m and weight >4000t.	N/A WKF water depth >75m and weight >4000t.	N/A CBA water depth >75m and weight >4000t.	N/A FLA water depth >75m and weight >4000t.	N/A FTA weight >4000t.	N/A BMA weight >4000t.	Applicable. Complete removal of WTA not assessed as feasible – refer to Section 3.2.4.1 of this EP.
3.2	All abandoned or disused installations or structures emplaced on the seabed on or after 1 January 1998, standing in less than 100m of water and weighing less than 4,000 tonnes in air, excluding the deck and superstructure, should be entirely removed.	Not applicable – all SPJs were installed prior to 1 January 1998.									
3.3	Removal should be performed in such a way as to cause no significant adverse effects upon navigation or the marine environment. Installations should continue to be marked in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) recommendations prior to the completion of any partial or complete removal that may be required. Details of the position and dimensions of any installations remaining after the removal operations should be promptly passed to the relevant national authorities and to one of the world charting hydrographic authorities. The means of removal or partial removal should not cause a significant adverse effect on living resources of the marine environment, especially threatened and endangered species.	Execution activities to achieve the proposed end states will be assessed in the future Campaign #1 – End State Execution EP/s. The end state options proposed avoid large scale dredging, which would be required to remove all SPJs below the seabed, and hence potential significant adverse effects this may cause in the marine environment.									

<table>
<tr><th colspan="2" rowspan="3">Guideline or Standard</th><th colspan="10">Facility and proposed end state</th></tr>
<tr><th>Halibut (HLA)</th><th>Kingfish A (KFA)</th><th>Kingfish B (KFB)</th><th>Mackerel (MKA)</th><th>West Kingfish (WKF)</th><th>Cobia (CBA)</th><th>Flounder (FLA)</th><th>Fortescue (FTA)</th><th>Bream A (BMA)</th><th>Whiting (WTA)</th></tr>
<tr><th colspan="8">Lower section of SPJs (including foundation piles and strut footings where applicable) decommissioned in place – cut to ensure minimum 55m clearance</th><th colspan="2">SPJ footings decommissioned in place – cut as close as practicable to the seabed (without large scale dredging)</th></tr>
<tr><td>3.4</td><td>The coastal State may determine that the installation or structure may be left wholly or partially in place where:</td><td colspan="10"></td></tr>
<tr><td>3.4.1</td><td>an existing installation or structure, including one referred to in paragraphs 3.1 or 3.2, or a part thereof, will serve a new use if permitted to remain wholly or partially in place on the seabed (such as enhancement of a living resource); and</td><td colspan="10">The impacts and risks of the end state options on the marine environment (including potential enhancement of living resources) is discussed and evaluated in Section 8 and Section 9 of this EP.</td></tr>
<tr><td>3.4.2</td><td>an existing installation or structure, other than one referred to in paragraphs 3.1 and 3.2, or part thereof, can be left there without causing unjustifiable interference with other uses of the sea.</td><td colspan="10">Potential interference to other users of the sea is discussed and evaluated in Section 8.3 of this EP.</td></tr>
<tr><td>3.5</td><td>Notwithstanding the requirements of paragraphs 3.1 and 3.2, where entire removal is not technically feasible or would involve extreme cost, or an unacceptable risk to personnel or the marine environment, the coastal State may determine that it need not be entirely removed.</td><td colspan="10">These aspects have been considered in the Options Feasibility screening for the Bass Strait SPJ facilities (refer to Section 3 of this EP).</td></tr>
<tr><td>3.6</td><td>Any abandoned or disused installation or structure, or part thereof, which projects above the surface of the sea should be adequately maintained to prevent structural failure. In cases of partial removal referred to in paragraphs 3.4.2 or 3.5, an unobstructed water column sufficient to ensure safety of navigation, but not less than 55 m, should be provided above any partially removed installation or structure which does not project above the surface of the sea.</td><td colspan="8">An unobstructed water column of minimum 55m will be provided above partially removed structures.</td><td>An unobstructed water column of 55m may not be provided above the remaining BMA structure (BMA is located in 59m water depth). This is dependent on the point at which the lowest practicable cut can be made without dredging. This is further assessed in Section 8.1 of this EP.</td><td>An unobstructed water column of 55m will not be provided above the remaining WTA structure, due to water depth (54m). This is further assessed in Section 8.1 of this EP.</td></tr>
</table>

Guideline or Standard		Facility and proposed end state									
		Halibut (HLA)	**Kingfish A (KFA)**	**Kingfish B (KFB)**	**Mackerel (MKA)**	**West Kingfish (WKF)**	**Cobia (CBA)**	**Flounder (FLA)**	**Fortescue (FTA)**	**Bream A (BMA)**	**Whiting (WTA)**
		Lower section of SPJs (including foundation piles and strut footings where applicable) decommissioned in place – cut to ensure minimum 55m clearance								**SPJ footings decommissioned in place – cut as close as practicable to the seabed (without large scale dredging)**	
3.7	Installations or structures which no longer serve the primary purpose for which they were originally designed or installed and are located in approaches to or in straits used for international navigation or routes used for international navigation through archipelagic waters, in customary deep-draught sea lanes, or in, or immediately adjacent to, routeing systems which have been adopted by the Organization should be entirely removed and should not be subject to any exceptions.	N/A – HLA location does not meet this criterion.	KFA, KFB and WKF are located adjacent to a Traffic Separation Scheme (TSS) established to keep vessels clear of the Esso Bass Strait production area. However, an assessment undertaken by AMC Search in 2022 (AMC Search, 2022a) (AMC Search, 2022b) concluded that allowing a clearance of 55m above the remaining infrastructure does not affect the passage of vessels. Hence even if the TSS was to be removed and vessels were to transit over the remaining structures, safe passage is not precluded.		N/A – MKA location does not meet this criterion.	Refer to KFA and KFB.	N/A – CBA location does not meet this criterion.	N/A – FLA location does not meet this criterion.	N/A – FTA location does not meet this criterion.	N/A – BMA location does not meet this criterion.	N/A – WTA location does not meet this criterion.
3.8	The coastal State should ensure that the position, surveyed depth and dimensions of material from any installation or structure which has not been entirely removed from the seabed are indicated on nautical charts and that any remains are, where necessary, properly marked with aids to navigation. The coastal State should also ensure that advance notice of at least 120 days is issued to advise mariners and appropriate hydrographic services of the change in the status of the installation or structure.	Advance notice to appropriate hydrographic services of the change of status of the structures has been included as a control in Table 10-1 of this EP. The requirement for additional aids to navigation has been assessed in Section 9.2 of this EP. On the basis of the risk assessment, marking the remaining property with further aids to navigation was not deemed necessary.									
3.9	Prior to giving consent to the partial removal of any installation or structure, the coastal State should satisfy itself that any remaining materials will remain on location on the seabed and not move under the influence of waves, tides, currents, storms or other foreseeable natural causes so as to cause a hazard to navigation.	The degradation of the SPJ materials and their predicted future position is discussed and evaluated in Section 8.5 of this EP.									
3.10	The coastal State should identify the party responsible* for maintaining the aids to navigation if they are deemed necessary to mark the position of any obstruction to navigation, and for monitoring the condition of remaining material. The coastal State should also ensure that the responsible party* conducts periodic monitoring, as necessary, to ensure continued compliance with these guidelines and standards.	Advance notice to appropriate hydrographic services of the change of status of the structures has been included as a control in Table 10-1 of this EP.									

<table>
<tr><th colspan="2" rowspan="3">Guideline or Standard</th><th colspan="10">Facility and proposed end state</th></tr>
<tr><th>Halibut (HLA)</th><th>Kingfish A (KFA)</th><th>Kingfish B (KFB)</th><th>Mackerel (MKA)</th><th>West Kingfish (WKF)</th><th>Cobia (CBA)</th><th>Flounder (FLA)</th><th>Fortescue (FTA)</th><th>Bream A (BMA)</th><th>Whiting (WTA)</th></tr>
<tr><th colspan="8">Lower section of SPJs (including foundation piles and strut footings where applicable) decommissioned in place – cut to ensure minimum 55m clearance</th><th colspan="2">SPJ footings decommissioned in place – cut as close as practicable to the seabed (without large scale dredging)</th></tr>
<tr><td>3.11</td><td>The coastal State should ensure that legal title to installations and structures which have not been entirely removed from the seabed is unambiguous and that responsibility for maintenance and the financial ability to assume liability for future damages are clearly established.</td><td colspan="10">Esso will retain legal title to the infrastructure remaining in place until such time as consent is received to surrender the relevant petroleum titles.
After title surrender, the provisions of Part 6.4 of the OPGGS Act are such that ‘trailing liability’ remains for infrastructure remaining in place. The trailing liability provisions may be used by the Regulator to require action to be taken by former titleholders if issues or impacts arise in relation to previously decommissioned property. The provisions within the OPGGS Act can be applied on an ongoing basis, including after a title has been wholly or partly surrendered.</td></tr>
<tr><td>3.12</td><td>Where living resources can be enhanced by the placement on the seabed of material from removed installations or structures (e.g. to create an artificial reef), such material should be located well away from customary traffic lanes, taking into account these guidelines and standards and other relevant standards for the maintenance of maritime safety.</td><td colspan="10">Placement of some sections of the removed upper sections of the SPJs on the seabed adjacent to the lower sections of some SPJs remaining in place has been included in this EP as a potential option, however Esso is not seeking to create an artificial reef by placing removed material on the seabed in an alternative location outside of the current title areas.</td></tr>
<tr><td>3.13</td><td>On or after 1 January 1998, no installation or structure should be placed on any continental shelf or in any exclusive economic zone unless the design and construction of the installation or structure is such that entire removal upon abandonment or permanent disuse would be feasible.</td><td colspan="10">Not applicable.</td></tr>
<tr><td>3.14</td><td>Unless otherwise stated, these standards should be applied to existing as well as future installations or structures.</td><td colspan="10">Noted.</td></tr>
</table>

*The terms ’party responsible’ and ‘responsible party’ refer to any juridical or physical person identified by the coastal State for a purpose mentioned in paragraph 3.10.

2.2.2 Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter 1972 and subsequent 1996 Protocol

Australia is party to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (the London Convention) and subsequent 1996 Protocol (the London Protocol) which aims to prevent pollution of the sea by dumping of wastes and other matters. The IMO is responsible for administering the London Convention/Protocol and has adopted guidance (International Maritime Organisation, 2000) for use where disposal of a platform or other structure at sea is contemplated. Guidance has also been issued by IMO regarding the development of artificial reefs to ensure this activity is consistent with the aims and provisions of the London Convention and Protocol (United Nations Environment Programme, 2009). The London Convention/Protocol is given effect in Australia by the Sea Dumping Act. Refer to Section 2.1.3.

2.2.3 Other relevant international conventions and agreements

The EPBC Act (refer to Section 0) provides the domestic legal framework for implementing Australia's obligations under a number of international conventions related to the environment, including the:

- Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 (Ramsar Convention)
- Convention Concerning the Protection of the World Cultural and Natural Heritage 1972 (World Heritage Convention)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973 (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals 1979 (Bonn Convention)
- Convention on Biological Diversity 1992 (Biodiversity Convention) and Agenda 21.

The EPBC Act also includes provisions relating to migratory bird conservation bilateral agreements. These include the:

- Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA), 1974
- 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 (CAMBA), 1986
- Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds (ROKAMBA), 2006.

2.3 State legislation

As the OAs for this EP are limited to Commonwealth waters, no relevant State legislation has been identified for this EP.

State legislation may be relevant to the assessment of indirect consequences of removing the property from the title area such as transporting sections of the removed SPJs onshore for dismantling and disposal. Management of waste is primarily the responsibility of the States and Territories, which regulate waste handling, including prescribed wastes, and disposal in accordance with their respective legislation, policies and programs.

At the time of submission of this EP, dismantling and disposal locations for the removed sections of the SPJs and the topsides have not been finalised and this is subject to further discussion and contracting with third party providers. Relevant state legislation as applicable will be included in the future Campaign #1 – End State Execution EP/s submission.

2.4 Industry guidelines

2.4.1 Offshore petroleum decommissioning guideline

Guideline: Offshore petroleum decommissioning (Department of Industry, Science, Energy and Resources, 2022) sets out the Australian Decommissioning Regulatory Framework, with the aim of assisting titleholders with planning and approval for decommissioning activities, and understanding the expectations of the relevant decision makers.

2.4.2 NOPSEMA Decommissioning Policy and Guidance

NOPSEMA has issued specific guidance to assist industry in meeting OPGGS Act obligations in relation to decommissioning. The following policies and guidance have informed this EP:

- Section 572 Maintenance and Removal of Property (NOPSEMA, 2022c):
- In accordance with Section 6.1.1 of Section 572 Maintenance and Removal of property of the OPGGS Act and Regulation 10A(h) of the OPGGS (Environment) Regulations, NOPSEMA must be reasonably satisfied that the Deviation EP meets the criteria for acceptance and complies with the OPGGS Act and its associated regulations. Refer to
- Table 2-3.
- *Decommissioning Compliance Strategy [2021 to 2025]* (NOPSEMA, 2021b)
- *NOPSEMA decommissioning compliance plan* (NOPSEMA, 2021d)
- *Complying with your decommissioning obligations* (NOPSEMA, 2021a)
- *Planning for proactive decommissioning* (NOPSEMA, 2021e)
- *Section 270 Consent to surrender title* (NOPSEMA, 2022a).
- *Consultation in the course of preparing an environment plan* (NOPSEMA, 2022b)

Table 2-3 Deviations from the requirements to maintain and to remove property – Criteria for acceptance

Criteria for acceptance	Section of EP
A feasibility assessment of all decommissioning options that could reasonably be undertaken and are likely to be successful.	Section 3

Criteria for acceptance	Section of EP
An evaluation of environmental impacts and risks of all feasible options, which is: • appropriate to the nature and scale of the activity • demonstrate compliance with relevant domestic legislation and international guidelines and standards (for example, those provided by the IMO Resolution A.672(16)) • consider information received during early consultation • demonstrate that the alternative arrangements, and any subsequent benefits, will be consistent with the principles of ecologically sustainable development • consider control measures necessary to manage the impacts and risks	Section 3 Section 6
Consider environmental impacts and risks within Australia's environment including, where relevant, indirect consequences that may arise from the petroleum activity of removing property etc. from a title area.	Section 8 and Section 9
A description of monitoring or survey activities proposed to be conducted to confirm decommissioning outcomes have been met, and that control measures have been implemented effectively, A description of the arrangements for long term management of property etc. which is not removed, including any ongoing monitoring	Section 11

3 Decommissioning Options Assessment

3.1 Overview

NOPSEMA's policy *Section 572 Maintenance and Removal of Property* (NOPSEMA, 2022c) requires that an EP seeking a deviation from the OPGGS Act Section 572(3) requirement for removal of all property must include:

- A feasibility assessment of all decommissioning options that could reasonably be undertaken and are likely to be successful;
- an evaluation of the environmental impacts and risks of all feasible options, , to enable NOPSEMA to have regard to the Australian Government Decommissioning Guideline policy principle that deviations will provide an Equal or Better Outcome (EOBO) when compared to complete property removal
- the evaluation of environmental impacts and risks of each option must include consideration of control measures necessary to manage the impacts and risks.

In addition, *Planning for proactive decommissioning* (NOPSEMA, 2021e) notes that:

- there is no one-size-fits-all approach to decommissioning. The nature and complexity of property varies considerably between projects and when combined with the safety, environment, economic, and technical considerations, mean that decommissioning each piece of property will have its own unique challenges. As such, decommissioning plans and programs should be developed to suit the specific circumstances of the petroleum project
- notwithstanding that complete removal of all property is the 'base case' as outlined in the *Guideline: Offshore petroleum decommissioning* (Department of Industry, Science, Energy and Resources, 2022), alternative end state options may be accepted by NOPSEMA through permissioning documents in accordance with other provisions of the OPPGS Act and its associated regulations as provided for under section 572(7).

Esso has undertaken a Decommissioning Options Assessment for the Campaign #1 SPJs in accordance with

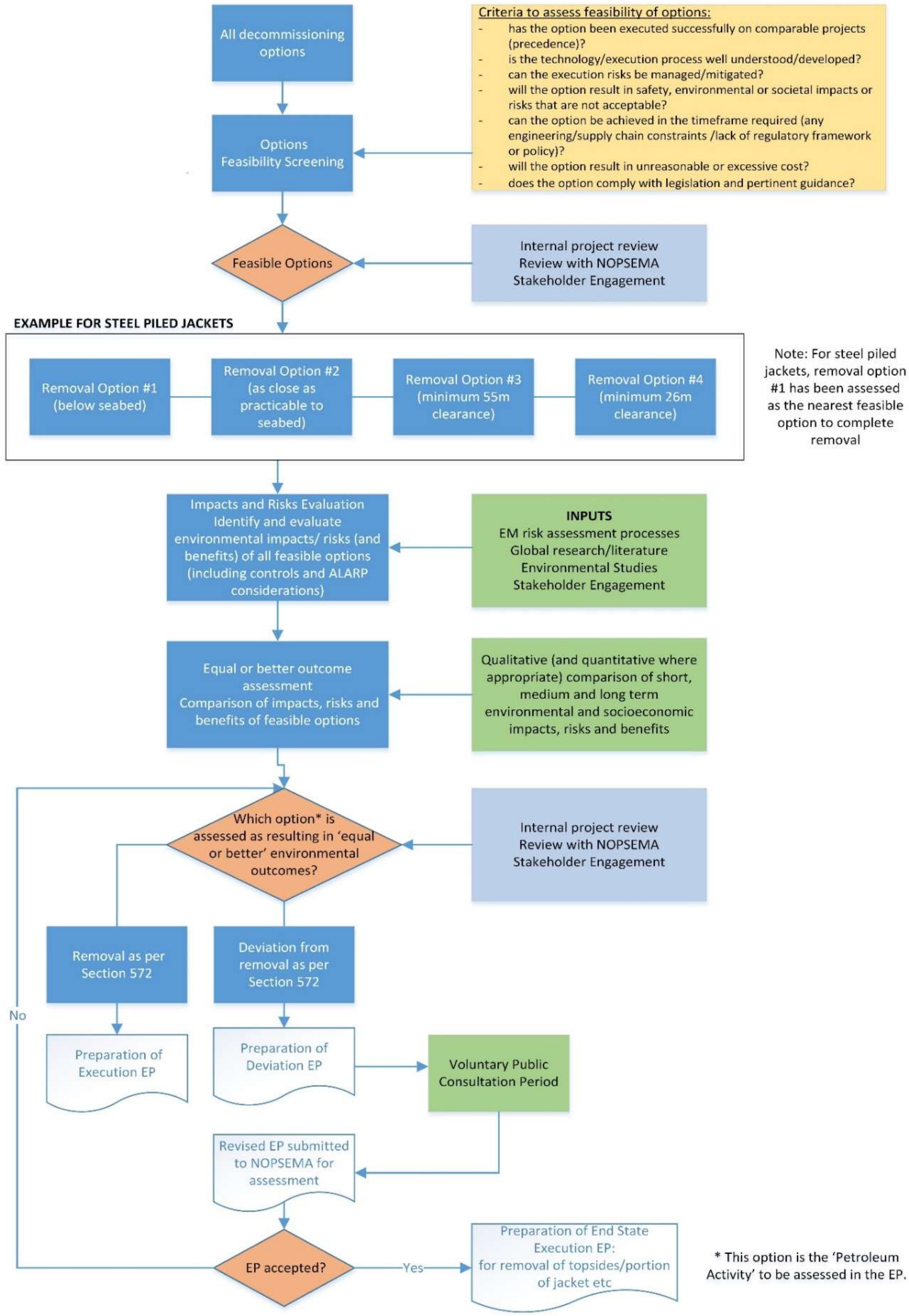


Figure 3-1. An overview of the process and the results of this assessment are provided in this Section.

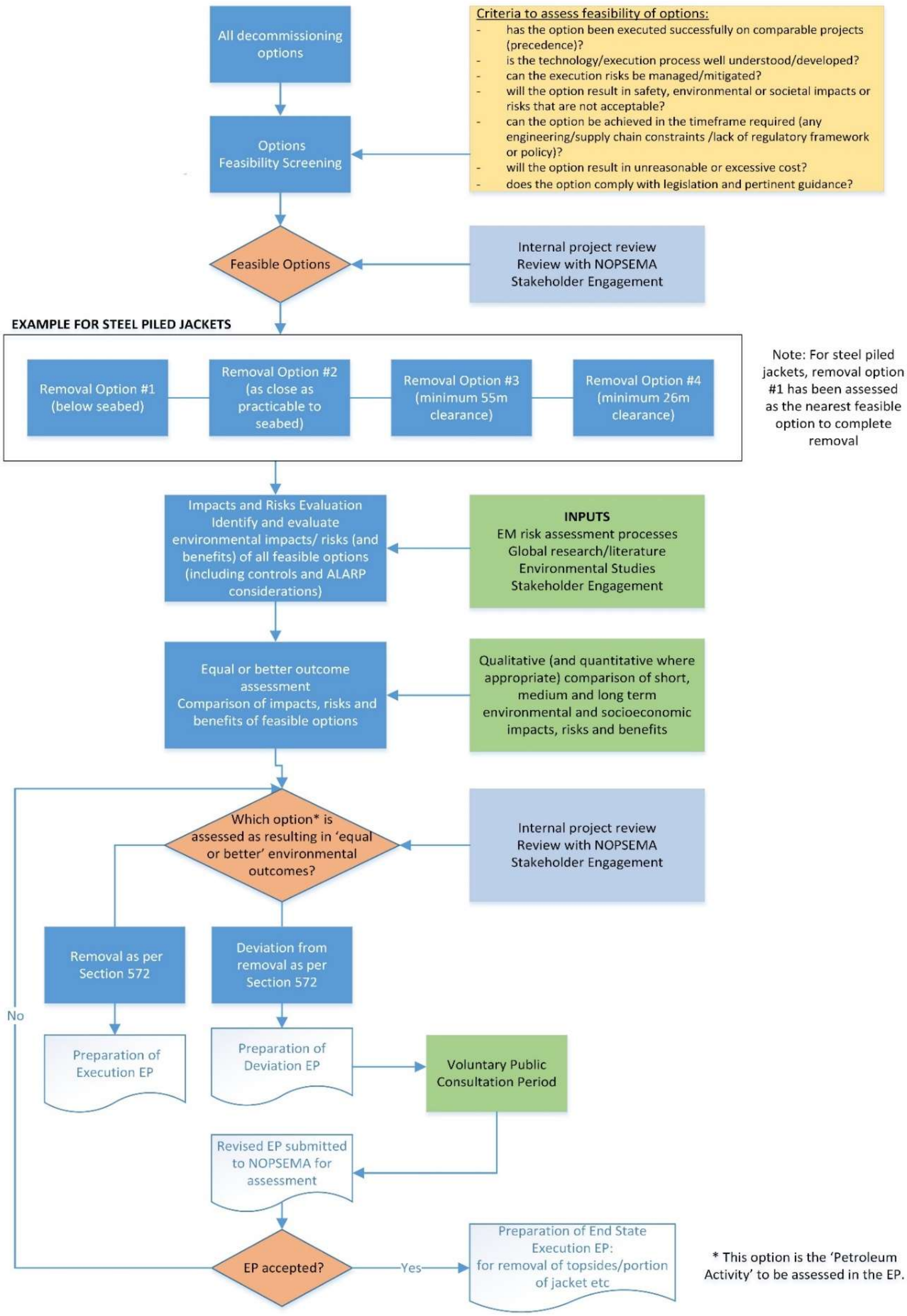


Figure 3-1 Overview of Decommissioning Options Assessment

3.2 Options feasibility screening

3.2.1 Overview of process and criteria

NOPSEMA requires the titleholder to undertake an evaluation of the feasibility of all decommissioning options that could reasonably be undertaken and are likely to be successful.

This section of the EP describes:

- the process undertaken to screen potential end state options for feasibility
- the criteria used to determine whether an end state option is feasible
- the end state options assessed for feasibility
- the results of the assessment.

In order to complete the feasibility screening, Esso evaluated potential end state options for the Campaign #1 SPJs within the scope of this EP against the criteria in Table 3-1.

Table 3-1 Screening criteria used to assess the feasibility of potential Steel Piled Jacket end state options

Screening criteria	Considerations
Precedents	Has the option been executed successfully on comparable projects – either internationally or within Commonwealth or State waters off Victoria or elsewhere in Australia?
Technical feasibility	Is the technology/execution process to achieve the option well understood/developed?
Execution complexity	Can the execution risks associated with the method to achieve the option be managed/mitigated?
Safety, environmental and societal acceptability	Will the option potentially result in safety, environmental or societal impacts or risks that are considered unacceptable?
Timing	Can the option be achieved in the timeframe required i.e. are there any engineering/supply chain constraints/lack of regulatory framework or policy that would preclude execution of the option?
Cost and liability	Will the option result in unreasonable or excessive cost or ongoing liability aspects?
Legislation and pertinent guidance	Does the option comply with applicable legislation and is consistent with relevant guidance?

Evaluation of the option against the screening criteria determined whether an option was considered to be feasible.

Each option screened as being feasible was then taken forward for further evaluation of:

- environmental impacts and risks

- whether the option would provide an equal or better environmental outcome relative to complete removal.

For the assessment, the SPJs within the scope of this EP were considered together, with any differences due to water depth, location, construction etc. noted and discussed for any implications during the assessment process.

3.2.2 Steel Piled Jacket end state options assessed

The end state options that have been assessed for each of the Campaign #1 SPJs within the scope of this EP are presented in

Table 3-2. No other potential end state options were identified through relevant person consultation processes that could not be included under any of the descriptions of options A through G.

Table 3-2 End State Options – Campaign #1 SPJs

Option	Description
A	Re-purpose the SPJ for an alternative use.
B	Complete removal of SPJ, including foundation piles up to 156m below the seabed. Further details regarding this Option are included in Section 3.2.4.1.
C	SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required). Further details regarding this Option are included in Section 3.2.5.1.
D	Lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed). Further details regarding this Option are included in Section 3.2.5.2.
E	Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. Further details regarding this Option are included in Section 3.2.5.3.
E plus placement	Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. Selected removed upper sections (excluding any with splash zone monel wrap or storage tanks) placed adjacent to the lower section remaining in place. Further details regarding this Option are included in Section 3.2.5.4.
F	Lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m. Further details regarding this Option are included in Section 3.2.5.5.
G	Full SPJ left in place with topsides removed and SPJ remaining above MSL.

	Further details regarding this Option are included in Section 3.2.4.3.

Under all options the facility topsides (the section of the facility containing production and service facilities) will be removed and transported to an onshore facility for dismantling and recycling/disposal. Esso will seek assessment and acceptance for the execution of this activity in future Campaign #1 – End State Execution EP/s.

3.2.3 Summary of results

Each of the potential SPJ end state options was assessed against the criteria outlined previously in Table 3-1.

Feedback during the voluntary public comment period indicated that a number of respondents support the re-use of the SPJs for uses such as environmental, marine or other research hubs, defence or weather outposts, training sites and tourism or wind farms. As noted in Table 2-2, Esso is continuing to investigate re-purposement options (Option A) for the Bass Strait SPJs. However, until such time as a viable re-use option is identified and plans approved, planning for the removal of all Campaign #1 SPJ's will continue, consistent with the requirements of General Direction #817. As such, Option A has not been taken forward as an option for assessment in this EP and is not discussed further.

Table 3-3 below presents a summary of the feasibility screening assessment conducted. At the conclusion of the screening, Option B and Option G were not considered to be feasible and were not taken forward for further assessment. The reasons for these conclusions are discussed in Section 3.2.4.

Options C, D, E and F were assessed as 'feasible' and were taken forward for further evaluation of environmental impacts and risks. These options are discussed further in Section 3.2.5.

Table 3-3 Summary of feasibility screening – Proposed Steel Piled Jacket end state options

Option		Criteria							Feasible?
		Precedents	Technical feasibility	Execution complexity	Safety, Environmental and Societal	Timing	Cost and Liability	Legislation and guidance	
A	Re-purpose the facility for an alternative use.	Re-purposement options continue to be assessed for feasibility.							
B	Complete removal of SPJ, including legs and foundation piles up to 156m below the seabed.	No known precedents.	Not feasible.	Execution risks cannot be managed/ mitigated.	Safety risks unable to be determined due to lack of reliable execution method.	Will not meet timing required by General Direction #817 due to execution complexity and lack of technically feasible method.	Cost considered disproportionate to socioeconomic benefits gained.		No
C	SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required).			Large scale dredging creates execution complexity and risks.	Potential for environmental impact associated with large scale dredging.	Large scale dredging would require an extended timeframe to execute.	Cost considered disproportionate to socioeconomic benefits gained.	Deviation from OPGGS Act Section 572(3) in accordance with Section 572(7).	Yes
D	Lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed).							Deviation from OPGGS Act Section 572(3) in accordance with Section 572(7).	Yes
E	Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m.							Deviation from OPGGS Act Section 572(3) in accordance with Section 572(7).	Yes
E plus placement	Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. Selected removed upper section(s) placed adjacent to the remaining lower section.							Deviation from OPGGS Act Section 572(3) in accordance with Section 572(7).	Yes

Option		Criteria: Precedents	Criteria: Technical feasibility	Criteria: Execution complexity	Criteria: Safety, Environmental and Societal	Criteria: Timing	Criteria: Cost and Liability	Criteria: Legislation and guidance	Feasible?
F	Lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m.	Accepted practice in the Gulf of Mexico			Clearance insufficient for large commercial vessels in adverse sea state and vessel orientation.			Deviation from OPGGS Act Section 572(3) in accordance with Section 572(7). Not consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989) but carried forward based on precedence.	Yes
G	Remove topsides and leave full SPJ in place.	No known precedents.			Environmental impacts and risks to other users of the sea not considered to be acceptable.		Ongoing liability aspects not considered to be acceptable (based on risks to other users of the sea).	Deviation from OPGGS Act Section 572(3) in accordance with Section 572(7). Not consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989).	No

3.2.4 Steel Piled Jacket end state options assessed as 'not feasible'

3.2.4.1 Option B

3.2.4.1.1 Complete removal of Steel Piled Jacket, including buried legs and deep piles

Option B requires the removal of the foundation piles (both main leg piles and skirt piles) that have been driven and cement grouted (that is, concreted) up to approximately 156 metres into the seabed.

Table 3-4 provides the pile configurations and numbers of piles for all of the SPJs within the scope of this EP.

Table 3-4 Foundation pile configurations for Campaign #1 SPJs

SPJ	Max. pile depth below seabed (m)	Number of piles				Estimated weight below seabed* (MT)
		Main	Skirt	Strut footing	Total	
Halibut (HLA)	145	16	16	8	40	2245
Kingfish A (KFA)	156	8	4	8	20	2866
Kingfish B (KFB)	156	8	4	8	20	2863
Mackerel (MKA)	102	4	12	N/A	16	2848
West Kingfish (WKF)	103	4	12	N/A	16	2294
Cobia (CBA)	102	4	12	N/A	16	3158
Flounder (FLA)	122	4	12	N/A	16	3261
Fortescue (FTA)	102	4	12	N/A	16	2973
Bream A (BMA)	107	4	8	N/A	12	1687
Whiting (WTA)	85	4	N/A	N/A	4	735
TOTAL		60	92	24	176	24,930

* Estimated weight is for steel and cement grout. MT = metric tonne

In order to ensure the integrity of wells producing to the facilities, the SPJs were designed to withstand 1-in-100-year storm events and the depth and design of the deep foundation piles reflects this. The consequence of this design is that these deep foundation piles were engineered to provide a strong, secure, and enduring bond with the soil. Future removal was not a consideration of the design standards of the day and no feasible method of complete removal at depth has been identified.

Figure 3-2 illustrates the extent of the foundation piles beneath the seabed for KFA. The image below depicts KFA without topsides and prior to any cutting and removal of the jacket substructure.

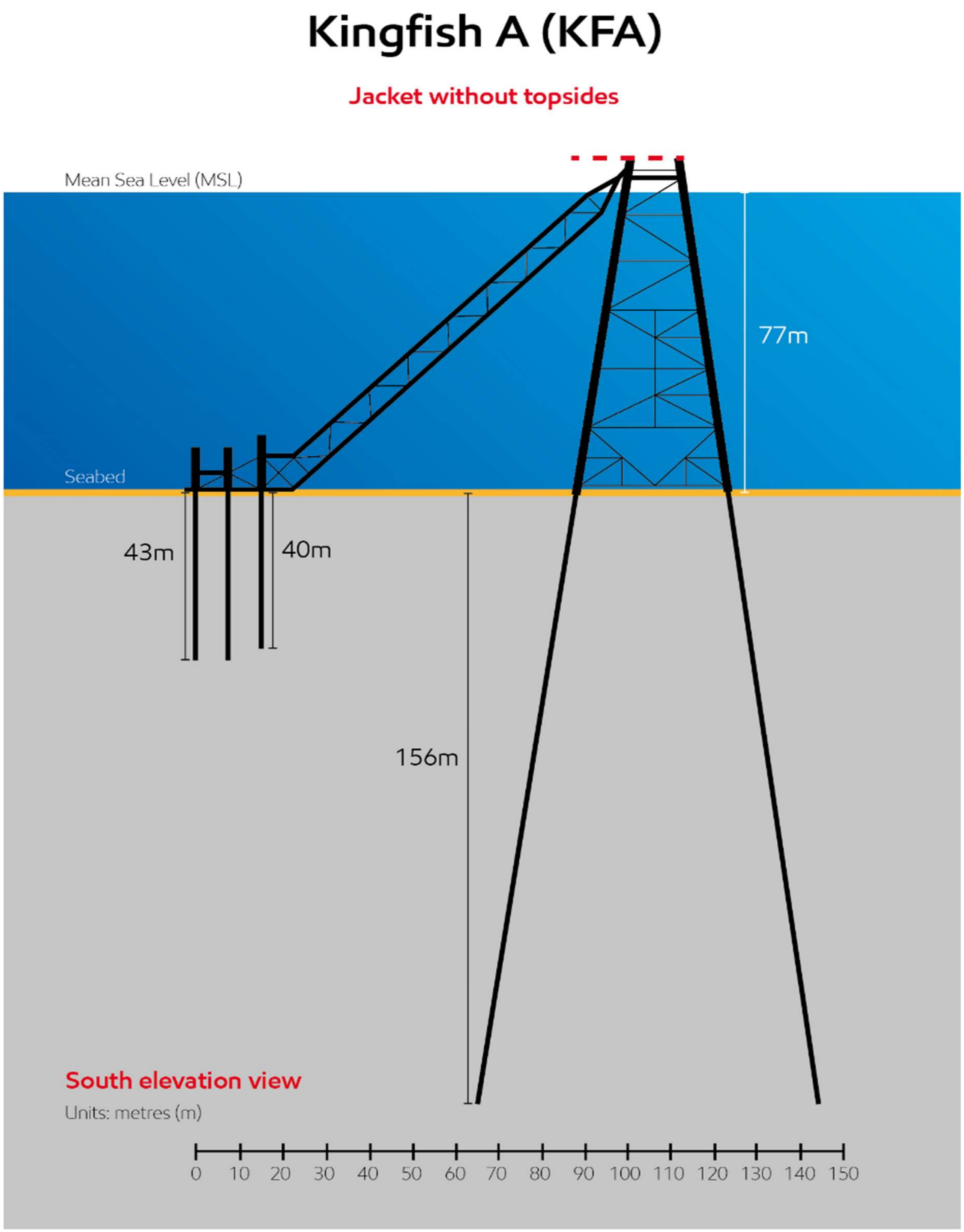


Figure 3-2 Schematic of Kingfish A facility

3.2.4.2 Deep foundation pile construction

The main features of the deep foundation piles are the:

- Pile sleeve (steel) – The outer pile segment which is the initial pile segment between the jacket, the upper soil regions and the pile insert.
- Pile insert (steel) – An inner pile segment driven to target depth.
- Cement grouted annulus – Cement grout between the outer diameter of the pile insert and the soil annulus and between the pile insert and pile sleeve.
- Cement grout plug – Typically there is a cement grout plug located at the base of the pile insert.

Figure 3-3 provides a schematic of a typical deep foundation pile.

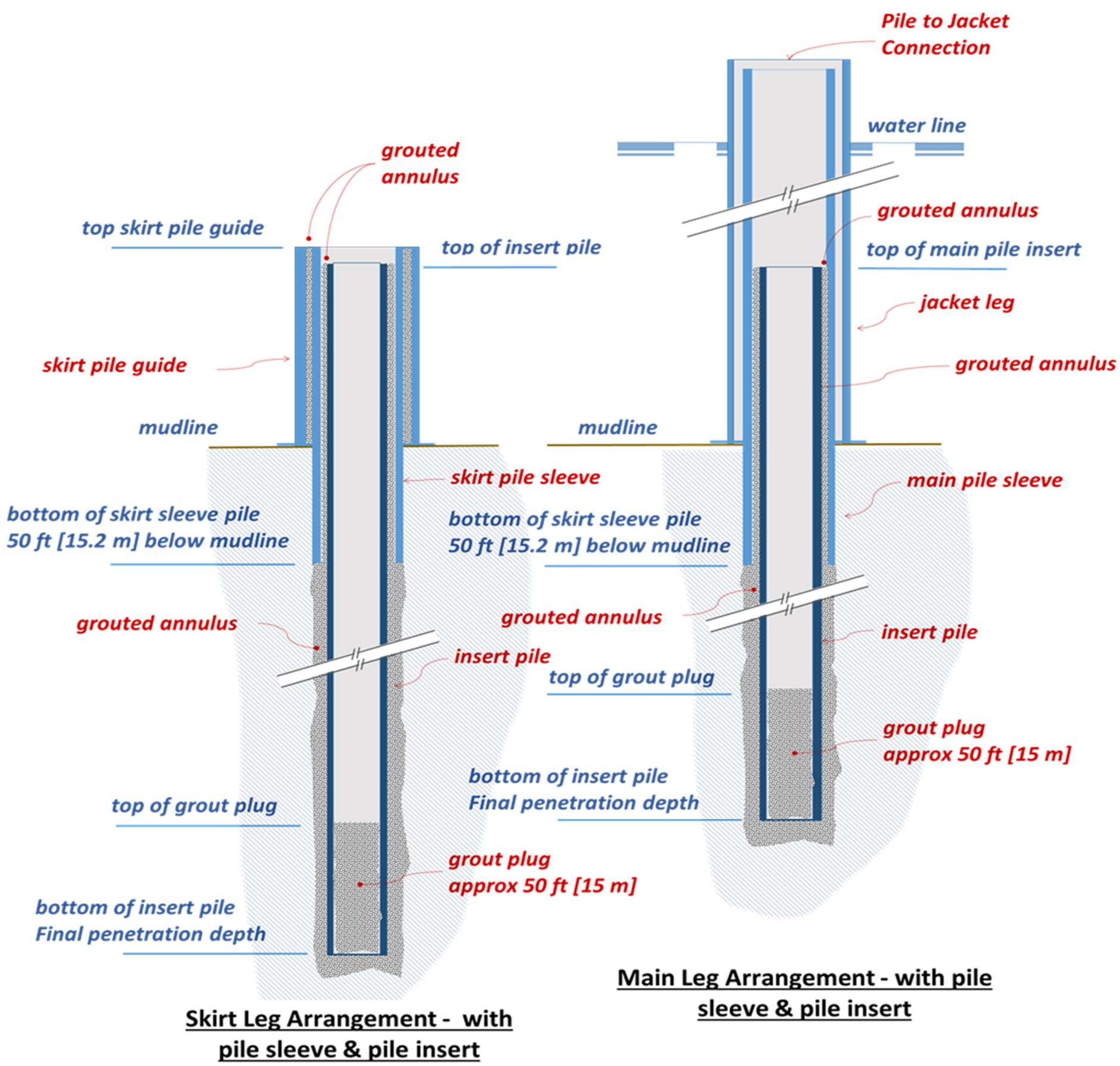


Figure 3-3 Schematic of a typical foundation pile

The key technical issue in achieving complete removal of the deep foundation piles is the absence of a precedent or proven technique to safely remove them in their entirety. Extremely high crane loads would be required to overcome the very high skin friction forces of the embedded piles. Theoretically, pile segments could be cut into smaller segments in an attempt to limit skin friction and prevent overloading of the removal vessel's crane, however, the potential for success of such pile cutting and extraction is highly uncertain. A few examples of the range of technical issues that would need to be resolved include:

- maintaining loss of interface friction for sufficient time to allow removal of the pile segments
- collapse of the bore hole – once the stabilising pile sleeve is removed, the bore holes may continue to collapse, hence necessitating continuous seabed dredging or new stabilising material, which would then also need to be removed
- complexity with removing the segments would increase with pile depth. The area of seabed dredging would likely need to be expanded further, impacting a significant seabed area the deeper the pile being removed
- possible snags and jamming of the cement grout segments during removal, possibly resulting in pile removal equipment being stuck below the seabed
- Safety risks associated with potential high pulling force against variable friction levels and risk of shock loading equipment.

Esso has not been able to establish any Australian or international precedents of SPJ foundation piles being removed to their full extent beneath the seabed. Given the lack of precedents and the technical issues outlined, a reliable and safe execution method has not been established for this activity. If such a method could theoretically be engineered, the configuration and number of the piles to be removed (176 piles for the Campaign #1 SPJs) would likely require an execution duration of many years and vast seabed and ecosystem disturbance to allow access to all piles for cutting and removal.

From an environmental perspective, the estimated corrosion rate for buried piles is expected to be slower than that for steel in seawater. Degradation studies have estimated that deep buried/cement grouted piles can be expected to corrode at a rate of 0.01 millimetres/year (Kent Plc, 2022). Foundation pile thicknesses range from 16-80 millimetres, which indicates that the foundation piles will slowly degrade until full dissolution in approximately 1600-8000 years. Given the very slow degradation rate, environmental impacts as a result of leaving the deep foundation piles in place are expected to be negligible.

Option B has been assessed as not feasible based on the following:

- no precedent for full removal of deep foundation piles was found
- a technically feasible method for removal of deep piles was not identified
- safety risks are not able to be adequately assessed, given the lack of a feasible removal method
- the environmental impacts of removal are not considered to be acceptable, given the extent of seabed and ecosystem disturbance that would be required to remove all 176 piles associated with Campaign #1 SPJs
- the extensive cost and duration to remove foundation piles would far outweigh any benefit to the environment or other users of the sea that may be realised by removal of the deep foundation piles.

3.2.4.3 Option G

3.2.4.3.1 Full Steel Piled Jacket left in place (topsides removed)

Option G would involve the removal of the topsides facilities, with the entire SPJ including steelwork above MSL left in place. An indicative example of the remaining structure for the MKA facility is shown in Figure 3-4. This Option has been assessed as not feasible due to a lack of Australian and international precedents. Ongoing impacts and risks to other users of the sea are also not considered to be acceptable, hence this Option has not been considered further.

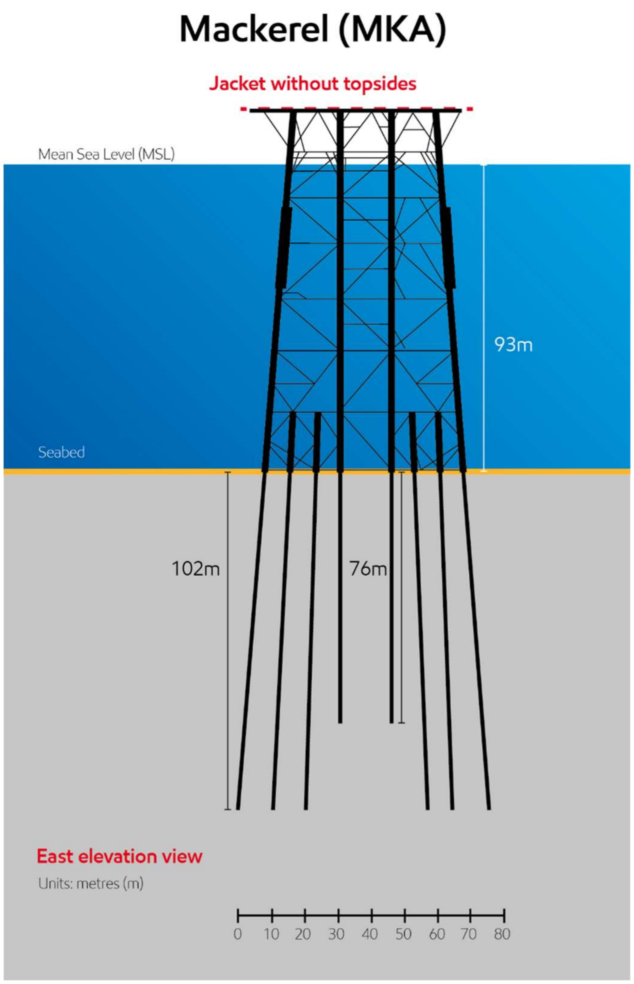


Figure 3-4 Schematic of Mackerel facility showing topside removal only

3.2.5 Steel Piled Jacket end state options assessed as 'feasible'

3.2.5.1 Option C

3.2.5.1.1 Steel Piled Jacket foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)

Option C would involve full removal of the SPJ and cutting of the foundation piles below the seabed. For simplicity, seabed is considered to be the elevation of the underside of the jacket.

For all SPJs except HLA, KFA and KFB this datum will be referenced off the underside of the jacket leg support rings and reflects the seabed at the time of SPJ installation. Indicative jacket support rings are shown in Figure 3-5 and an image of a jacket support ring is included in Figure 3-6 . For HLA, KFA and KFB, the bottom part of the jacket leg self penetrates into the seabed and a logical cut point below seabed would be determined as part of the development of the Campaign #1 – End State Execution EP/s.

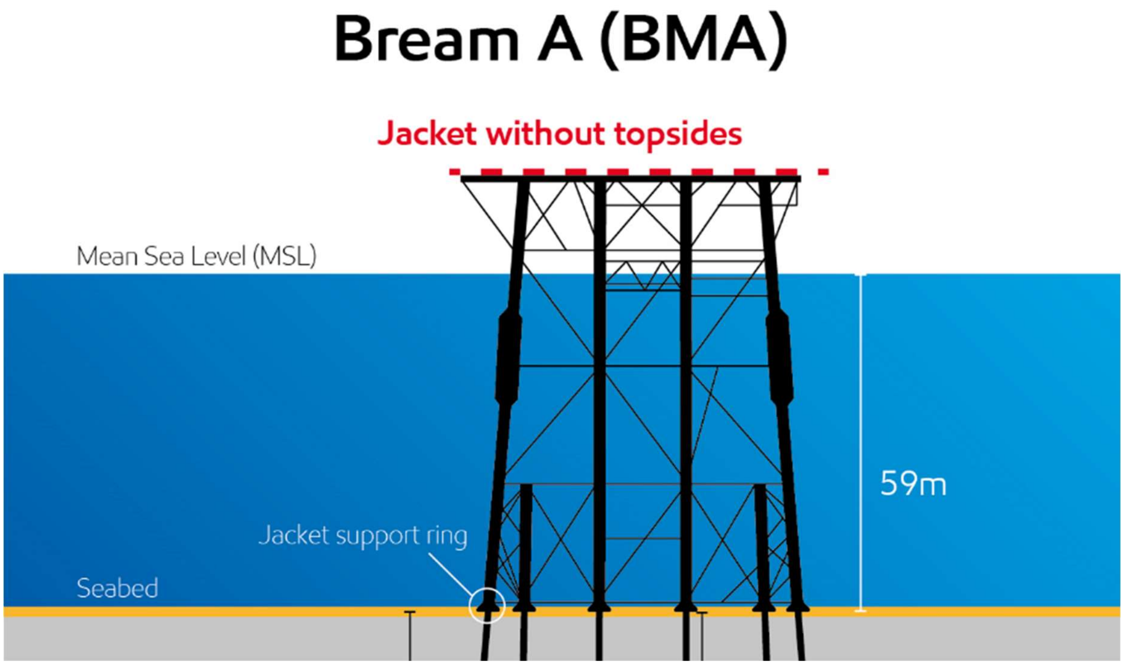


Figure 3-5 Schematic of Bream A facility showing indicative jacket support rings

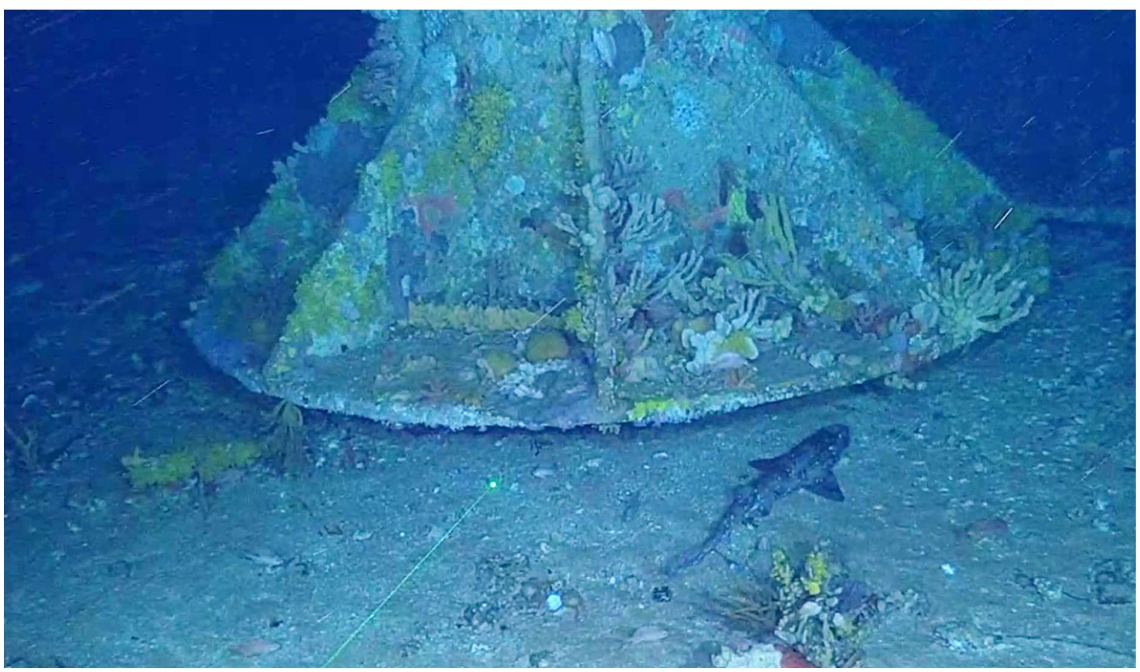


Figure 3-6 Image of a jacket support ring at Cobia

There are two potential execution methods that can be utilised to separate a jacket from the foundation piles below seabed level:

- internal cutting techniques
- external cutting techniques.

Internal cutting refers to the technique of lowering an internal cutting tool inside the foundation piles and, in this case, below the seabed depth, to make the cut. For this technique to be feasible, there needs to be no obstructions, such as cement grout or soil plugs, within the SPJ legs. It will not be possible to assess whether such obstructions are present before removal of the topsides and closer inspection of skirt piles. Where obstructions are found, it is not guaranteed that they can be removed to allow internal cutting to be successful. Review of ROV visual inspections from above skirt piles has confirmed the presence of some obstructions within piles across all SPJ locations. Given the uncertainty of success for internal cutting, external cutting of all 176 foundation piles below the seabed is considered as the conservative basis for assessment of execution feasibility.

External cutting equipment requires external access to each pile below the seabed for the cutting equipment. To provide the required access to the piles below the seabed, large scale dredging of the seabed sediments is assumed to be required to provide sufficient clearance around the piles for a remotely operated vehicle (ROV) and cutting tool to be able to operate.

An estimate of the dredging volumes required to allow the external cutting of each pile associated with the Campaign #1 SPJs has been made by adopting a similar dredge profile to that undertaken during the decommissioning of the platforms in the Sable Offshore Energy project in Canada. For the purpose of this estimate, cutting with a diamond wire cutting tool was assumed. The Sable project provided a range of lower and upper bound dredging rates and also demonstrated the physical volume of dredge required to provide reasonable access for a ROV with diamond wire cutter. Figure 3-7 provides a pictorial of the indicative dredged area (denoted in blue) required around a single pile to provide access for a ROV and cutting tool (an area approximately 20 metres long, 5 metres wide and 5 metres deep). Figure 3-8 provides an indicative dredging arrangement for the MKA platform if each pile was to be cut externally to a depth of 3m below the seabed.

In order to establish a worst-case scenario basis for the purpose of impact and risk assessment, this Option assumes all 176 piles associated with the SPJs covered in this EP will need to be dredged.

A dredge volume of 610 cubic metres per individual pile has been assumed, based on the comparative dredging required to access the piles for external cutting during the removal of the Sable platforms. A simple multiplication of *dredge volume per individual pile x number of piles* estimates that over 100,000 cubic metres of seabed would need to be dredged. However, the proximity of some piles to each other (hence an overlap in dredged area) has been considered. This results in a maximum estimated required dredge volume of approximately 88,000 cubic metres of seabed. Estimated dredge volumes on an individual facility basis are included in Appendix A6.

This example arrangement assumes the surrounding sediments would remain stable and the excavated areas would not be subject to slumping, replenishment or other disturbance which would require re-dredging or alteration of pile excavations during the works. Re-dredging has been excluded from all dredge volume or work duration estimates for the purpose of impact assessment. In practice however, given the active Bass Strait currents, some re-dredging may be required to maintain sufficient hole depth for long enough to achieve effective operation of the ROV and cutting tool below seabed.

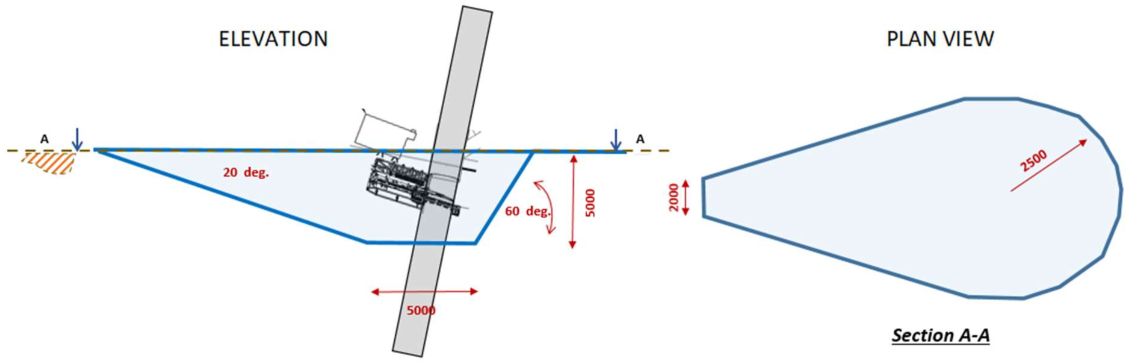


Figure 3-7 Indicative area of dredging required around each pile

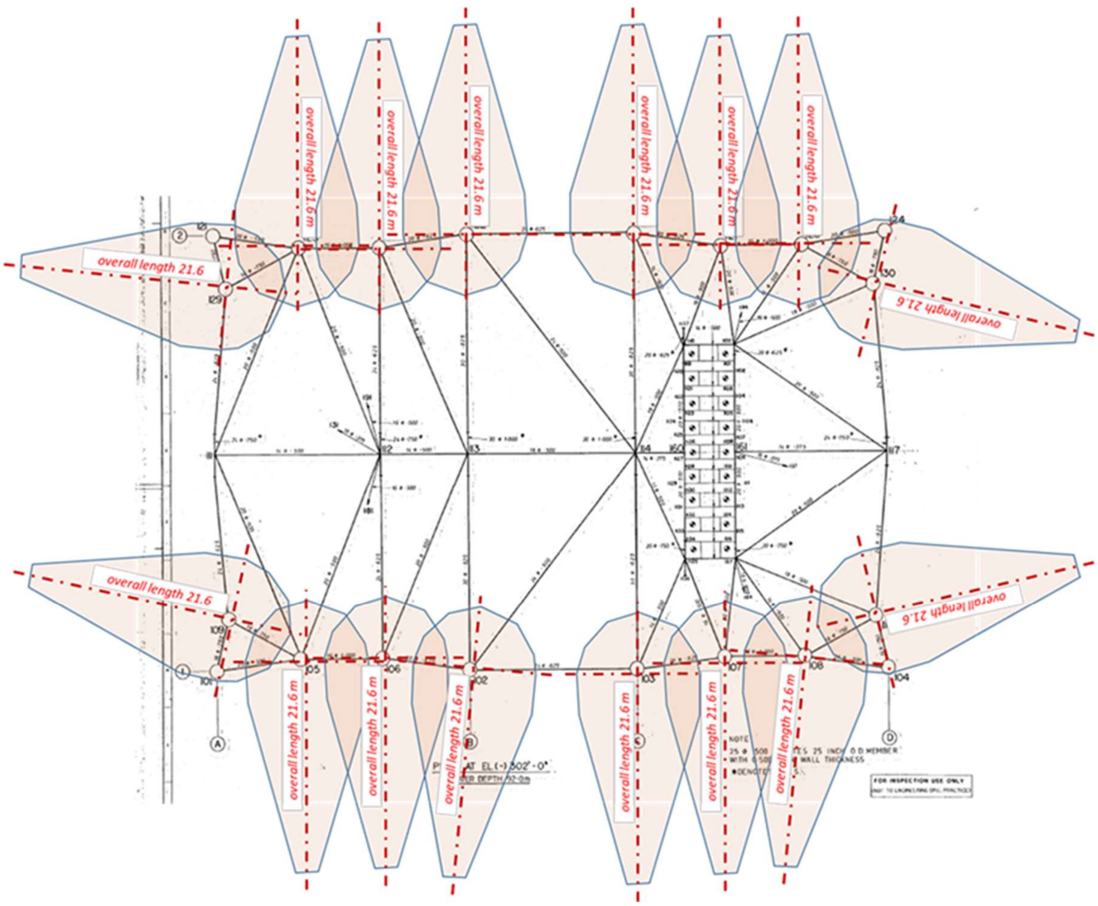


Figure 3-8 Plan view of Mackerel platform indicative dredging arrangement for external pile cutting

Based on the adopted dredge rate and vessel needs assumptions, the extent of dredging required to facilitate below seabed cutting for all 176 piles is estimated to require in the order of 343 construction support vessel (CSV) days and 114 heavy lift vessel days to execute. This estimated vessel time was considered separately to the vessel time required for the cutting and removal of the SPJ for the purpose of comparative impact assessment. This additional vessel time may result in significant environmental impacts from prolonged vessel operations. Impacts include but are not limited to vessel fuel consumption emissions, wastes, light and cumulative marine noise generated by the dredge equipment in conjunction with that generated from the support vessels.

Given the depth to seabed, recovery and onshore disposal of dredge spoil is not considered feasible. All dredge spoil would be discharged directly into the surrounding marine environment. The impact to fish and surrounding benthic assemblages from the dispersal of dredged material depends on many variables, including the volume of the sediment, the characteristics of the released sediment and oceanographic conditions at the disposal locations (Cruz-Motta & Collins, 2004).

At the conclusion of the works, any resulting depressions in the seabed would be left to backfill naturally over time, as shown in Figure 3-9. Natural replenishment of dredging depressions is expected to occur within a decade of the works occurring.

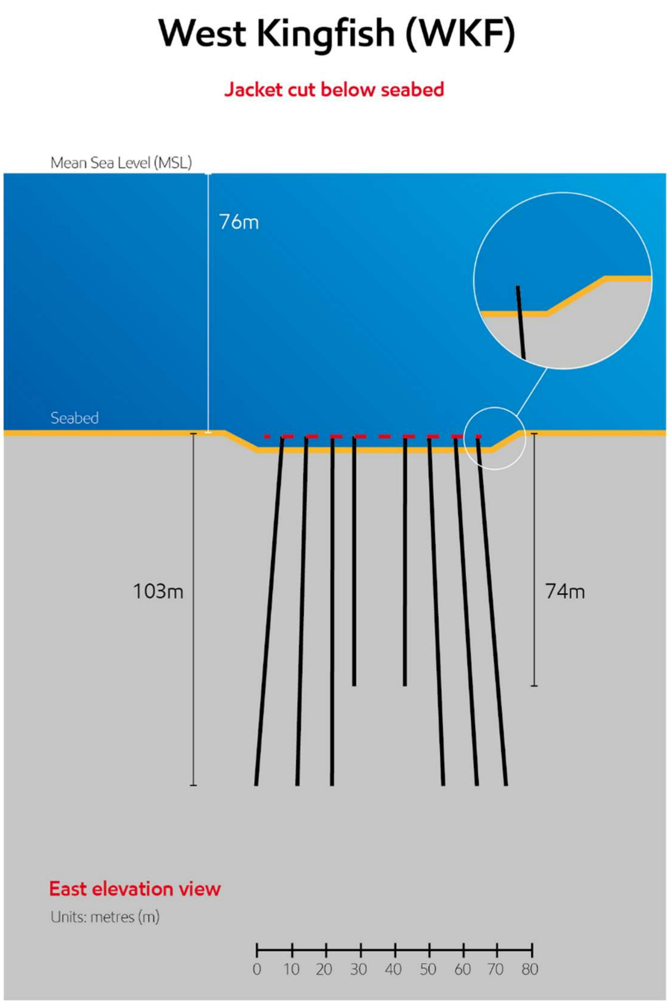


Figure 3-9 Schematic of West Kingfish facility showing Option C

3.2.5.1.2 Ecological impacts of Option C

The complete removal of all Campaign #1 SPJs to below the seabed and the associated dredging of all 176 piles would result in a significant alteration to the ecological communities which have developed within the SPJ surrounds since installation of the SPJ's. It is expected to take many years for dredged areas to recover to a sediment cover state comparable with the nearby surrounding environment.

Under this Option, all sessile benthic fauna and infauna surrounding all the SPJs that is too slow or unable to move away from the dredge area and the dredge spoil plumes is likely to be buried or smothered as sediments become mobile in the water column and then settle back on the seabed. Small sessile fauna that are filter or suspension feeders are the most vulnerable category to impacts from dredging, including mussels, barnacles, small sessile worms and sponges (AECOM Australia Pty Ltd, 2011).

One study (Newell, Seiderer, & Hitchcock, 1998) suggests that marine communities conform to well-established principles of ecological succession, and that these allow some realistic predictions on the likely recovery of benthic communities following cessation of dredging. Recolonization of dredged deposits is initially by 'opportunistic' species and the community is subsequently supplemented by an increased species variety of long-lived and slow-growing 'equilibrium' species that characterise stable undisturbed deposits such as coarse gravels. Rates of recovery reported in the literature suggest that a recovery time of six to eight months is characteristic of many estuarine muds where frequent disturbance of the deposits precludes the establishment of long-lived components. In contrast, a community of sands and gravels (similar to the broader Gippsland Basin environment) may take two to three years to establish, depending on the proportion of sand and level of environmental disturbance by waves and currents, and may take even longer where rare slow-growing components were present in the community prior to dredging. As the deposits get coarser along a gradient of environmental stability, estimates of five to 10 years are probably realistic for development of the complex biological associations between the slow-growing components of equilibrium communities characteristic of reef structures.

Sampling and analysis of sediments around the WTA, KFA, CBA, HLA and FLA facilities was undertaken in early 2021 (Hook S. E., et al., 2022). The outcomes of sediment analysis are discussed in more detail in Section 5 however in summary, the analysis indicated that there were concentrations of metal and polycyclic aromatic hydrocarbon (PAHs) measured in the sediments around the facilities, although these rarely exceeded the adopted screening level guidelines. Measured concentrations were most often located within 200 metres of the facility structures. In the event of dredging in the immediate vicinity of the jacket to gain access to the foundation piles, sediments will be suspended. Upon resuspension, a portion of the metals and PAHs that are associated with the sediment could desorb and become biologically available to filter-feeding organisms, with impacts potentially exacerbated by the mobilisation of suspended sediments to a wider area via currents (Hook S. E., et al., 2022).

Option C is technically feasible and whilst there is international precedence for the approach, the potentially significant cumulative environmental impacts to the local marine ecology need to be considered. Relevant person feedback from an eNGO received during the preparation of this EP also indicated that they would not support an end state option that involves dredging of the seabed.

As the 'full removal' (Option B as described in Section 3.2.4.1) was assessed as 'not feasible', Option C – SPJ foundation piles left in place, with cut line below the seabed, has been deemed as the closest feasible option to complete removal and hence has been used as the 'base case', against which 'deviation options'[2] have been compared in the EOBO Assessment.

3.2.5.2 Option D

3.2.5.2.1 Steel Piled Jacket (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed, without large scale dredging of the seabed

Option D results in the topsides being removed and the SPJs being cut and removed as close as practicable to the seabed. Cuts will be made as close as practicable to the seabed, which may be either above or below the seabed – on a case-by-case basis. The final cut locations will be determined by the removal contractor, in consideration of a number of factors, including but not limited to:

- The feasibility of internal cutting (which would achieve a cut below seabed). As detailed in Section 3.2.5.1, for this technique to be feasible, there must be no obstructions, such as cement grout or soil plugs, within the SPJ legs. It will not be possible to assess whether such obstructions are present before removal of the topsides and closer inspection of skirt piles. Where obstructions are found, it is not guaranteed that they can be removed to allow internal cutting to be successful. Review of ROV visual inspections from above skirt piles has confirmed the presence of some obstructions within piles across all SPJ locations;
- Safety considerations for transport of the removed sections of the SPJs i.e. to enable the removed sections to be sea fastened and transported securely, a cut just below a lower brace on the SPJ is likely to be required. This will determine the final cut height above the seabed and will vary by SPJ;
- The cutting equipment proposed for use, which would determine the extent of dredging required to provide access to cut locations and working clearance for external cutting equipment.

A cut below seabed may be achieved if internal cutting methods are successful. In the event internal cutting is not successful, dredging may be required in order to provide access for the cutting tool to cut as close as practicable above the seabed, at a location on the SPJ that will allow for safe transportation of the removed jacket sections. If cuts are made above the seabed, the final height of the SPJ lower section and strut footing (where this is present at HLA, KFA and KFB) is not expected to exceed 5 metres above the seabed.

Given the range of outcomes under this Option, for each aspect considered in the impacts and risks assessment, the 'worst-case' outcome specific to each scenario has been assumed. For example, in the context of potential impacts as a result of habitat removal, it has been assumed that the SPJs would be cut below the seabed, but for potential impacts and risks to commercial fishing, it has been assumed that up to five metres of the SPJ may remain above the seabed.

Execution parameters including but not limited to the practicability of cut locations, cut methods, tool options and vessel requirements have been assumed for the purpose of

[2] 'Deviation options' in this context is defined as those options which are different to the OPGGS Act Section 572(3) requirement for full removal of property from the title area once it is neither used nor to be used in connection with the operations. Such deviations may be agreed to by NOPSEMA through a permissioning document per Section 572(7).

assessing environmental impacts and risks as a result of this Option. Execution aspects will be addressed in the Campaign #1 – End State Execution EP/s once a removal contractor has been selected and equipment, vessels and removal methods are better defined.

This Option results in the removal of the majority of the SPJ and avoids the significant environmental impact associated with large scale dredging of all 176 piles to cut below the seabed as considered in Option C (refer to Section 3.2.5.1).

Figure 3-10 depicts the SPJs following removal of the topsides and the upper sections under Option D.

Option D was assessed as feasible using the criteria outlined in Section 3.2.3 and taken forward for further assessment of environmental impacts and risks and the EOBO Assessment.

During the voluntary public comment period for this EP, feedback was provided that Option D could be improved by cutting the SPJs flush with the seabed, that there was no requirement for 5m of the SPJ to be left in place and that the draft EP did not provide sufficient justification that cutting the SPJs flush with the seabed requires dredging. Further information has been added to this section (above) to address this feedback.

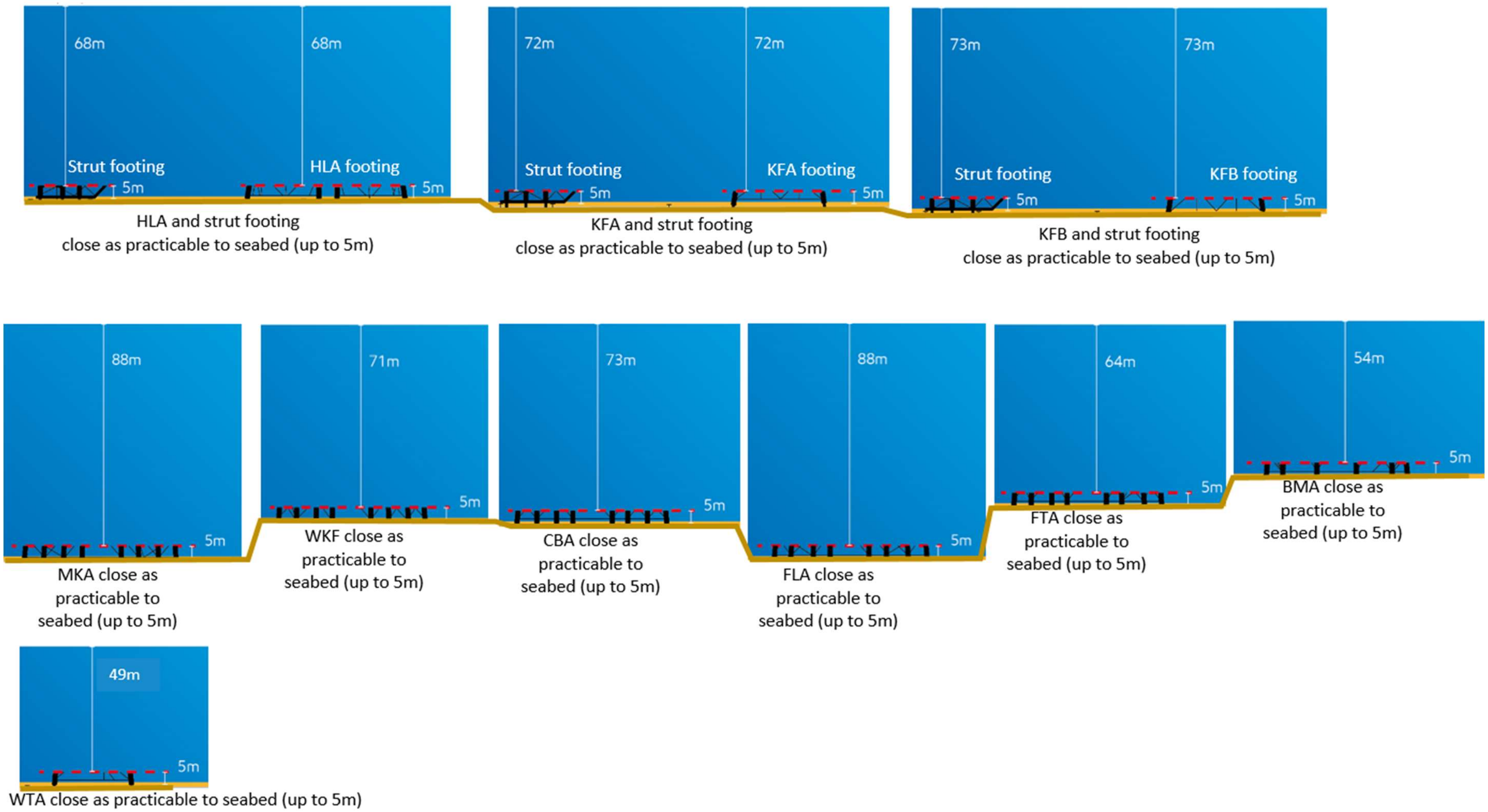


Figure 3-10 Option D – Steel Piled Jacket lower sections (including strut footings) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed)

3.2.5.3 Option E

3.2.5.3.1 Lower section left in place with cut line to achieve a minimum clearance of 55 metres below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55 metres

Option E results in the topsides being removed and the upper section of the SPJ being cut and removed to provide a minimum clearance of 55 metres below MSL. The lower sections of the SPJ below 55 metres would remain in place. As discussed in Section 3.2.5.2, the final cut location will be determined by the removal contractor in consideration of a number of factors, including the requirement to facilitate safe transport of the removed SPJ sections, which may require cutting below a brace on the SPJ. Hence while a minimum clearance of 55m below MSL will be achieved where water depth allows, the final height of the remaining lower sections above the seabed may vary by SPJ. Strut footings where present will be cut at a practical location with a minimum clearance of 55 metres. Strut footings are present at HLA, KFA and KFB.

The 55 metres clearance depth is consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989), which states:

“In cases of partial removal…. An unobstructed water column sufficient to ensure safety of navigation, but not less than 55 m, should be provided above any partially removed installation or structure which does not project above the surface of the sea.”

Figure 3-11 depicts the SPJ’s following removal of the topsides and the top section of SPJs under Option E.

Option E was assessed as feasible using the criteria outlined in Section 3.2.3 and taken forward for further assessment of environmental impacts and risks and the EOBO Assessment. It is noted that WTA and BMA are excluded from assessment under Option E due to insufficient water depth.

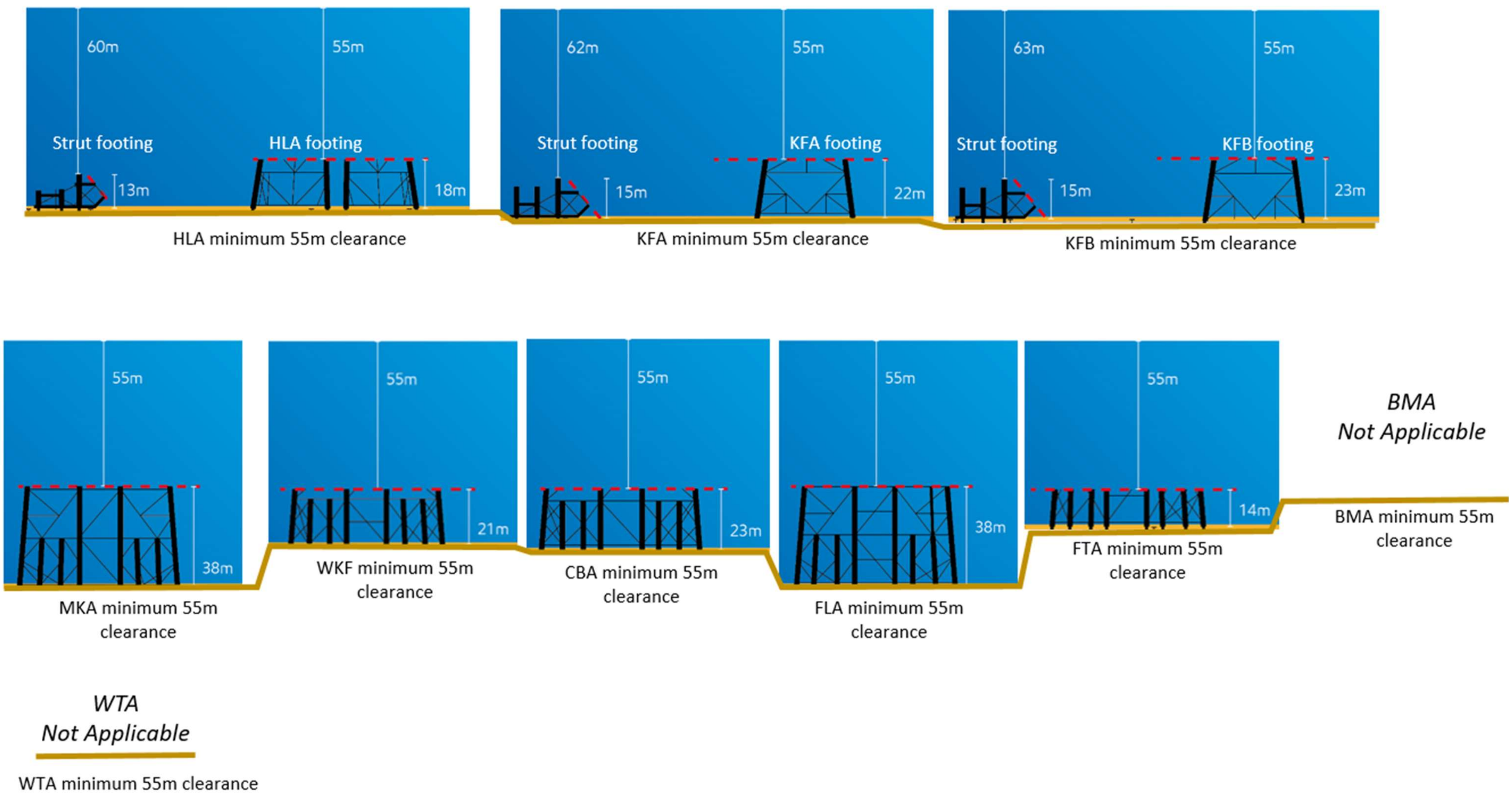


Figure 3-11 Option E – Lower section left in place with cut line to achieve a minimum clearance of 55 metres below mean sea level plus strut footings cut at a practical location with a minimum clearance of 55 metres

3.2.5.4 Option E plus seabed placement

3.2.5.4.1 Lower section left in place with cut line to achieve a minimum clearance of 55 metres below MSL plus strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55 metres. Selected portions of the removed SPJ placed adjacent to the remaining footings

This Option is based on achieving the minimum clearance depth as Option E for the SPJs; it also includes placement on the seabed of a number of removed SPJ sections adjacent to the footings of the original structure.

Only removed sections of the SPJs and struts that are free from coatings and storage tanks would be considered for placement under this Option. An example of removed sections of the SPJ that might be considered for placement is shown in Figure 3-12.

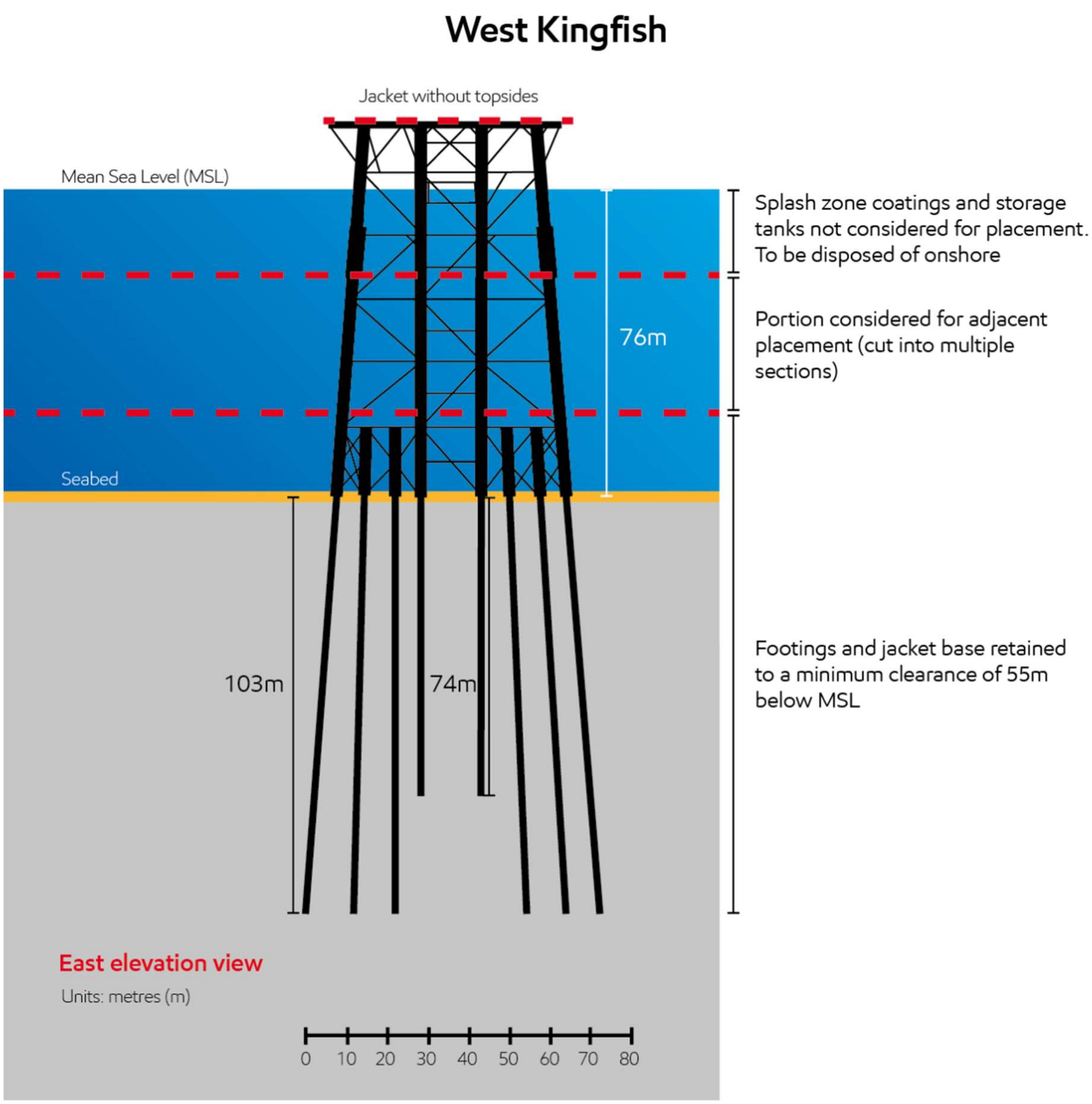


Figure 3-12 WKF example consideration of placement suitability

Placement is proposed on the seabed as close as practicable to the respective SPJ lower section within the title area. An indicative example of this is included in

Figure 3-13. Placed sections would need to achieve a minimum clearance depth of 55 metres. For this reason, WTA, BMA and FTA are excluded from the seabed placement option due to insufficient water depth. For the purpose of impact and risk assessment, the maximum potential mass of SPJ that may be placed has been adopted. These quantities are included in Appendix A2.

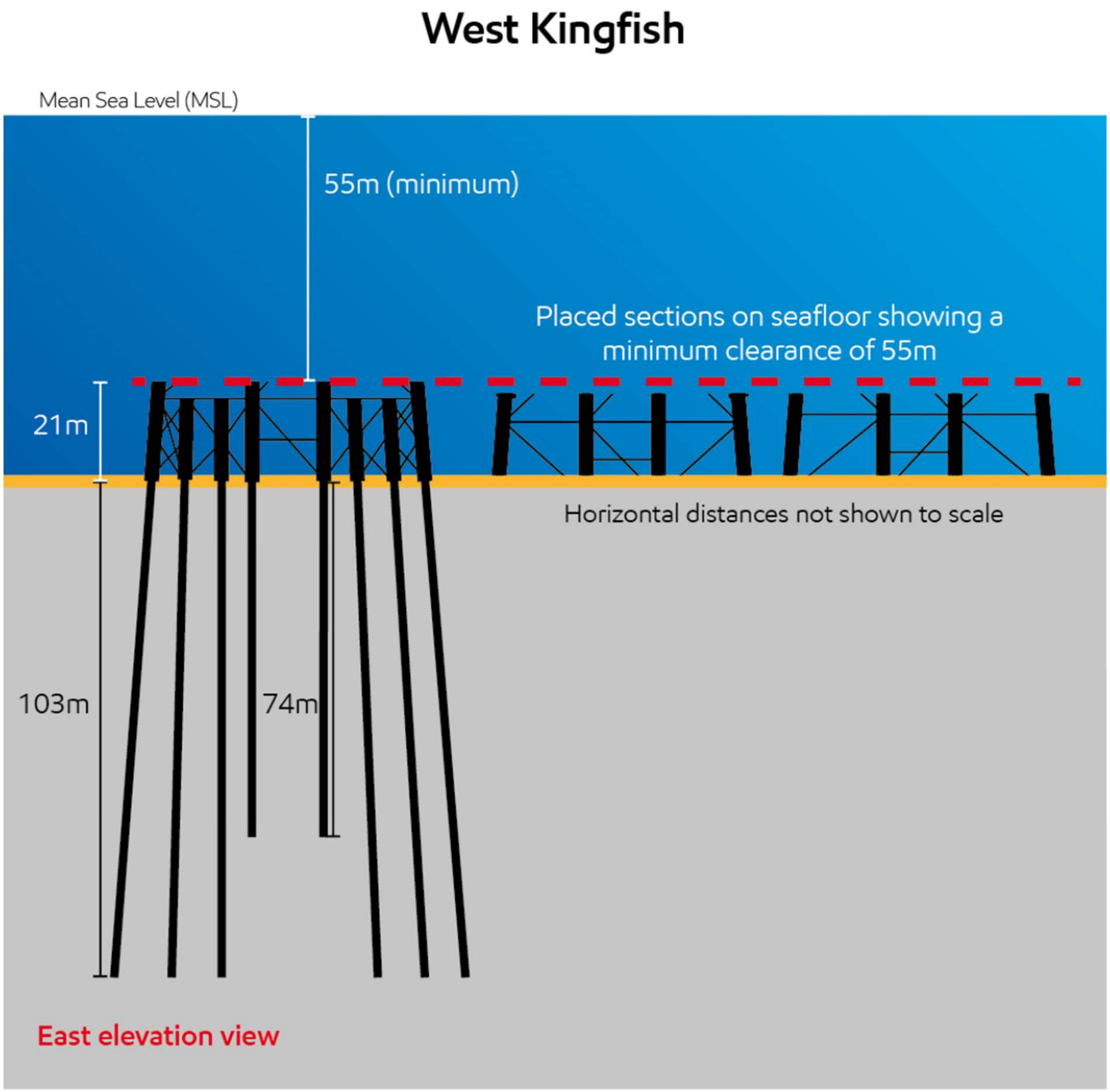


Figure 3-13 WKF Example of Adjacent Placement

Technical aspects of this Option would be further designed based on the removal contractor's equipment capacity and removal methodology. The number of removed sections placed on the seabed and the placement positions would be assessed as part of developing the Campaign #1 – End State Execution EP/s. The actual distance of placement of sections from the SPJ lower sections would be determined by a Seabed Placement Location Assessment (refer to Table 10-2).

Adjacent placement may possibly be achieved with a similar cutting effort to Option E depending on the vessel size and heavy lift capabilities of the removal contractor. However, as a worst-case scenario for the purpose of impact and risk assessment, it was assumed that more cutting effort would be required. An assumed maximum number of placed sections for each SPJ are included in Appendix A7.

Option E plus placement was assessed as feasible using the criteria outlined in Section 3.2.3 and taken forward for further assessment of environmental impacts and risks and the EOBO Assessment.

3.2.5.5 Option F

3.2.5.5.1 Lower section left in place with cut line to achieve a minimum clearance of 26 metres below MSL. Strut footings where present will be cut at a practical location with a minimum clearance of 26 metres

The 26-metre clearance was assessed based on consideration of precedents from the decommissioning of SPJs to this depth in the Gulf of Mexico (e.g. High Island-A-480 reef). Refer to Texas Parks and Wildlife Department Artificial Reefs Interactive Mapping (https://tpwd.texas.gov/gis/ris/artificialreefs).

Option F results in the topsides being removed and the upper section of the SPJ and strut (where present) being cut and removed to provide a minimum clearance of 26 metres below MSL. The lower sections of the SPJs would remain in place. Strut footings where present will be cut at a practical location with a minimum clearance of 26 metres. Strut footings are present at HLA, KFA and KFB. As well as the 26-metre clearance, additional cut depth has been included for MKA and FLA to ensure potential chemical and hydrocarbon residues associated with storage facilities within the upper SPJ sections are removed and taken onshore for appropriate dismantling and disposal. Minimum clearance for these SPJs would be approximately 40 metres for MKA and 31 metres for FLA.

Figure 3-14 depicts the SPJs following removal of the topsides and the top section under Option F.

Option F was assessed as feasible using the criteria outlined in Section 3.2.3 and taken forward for further assessment of environmental impacts and risks and the EOBO Assessment.

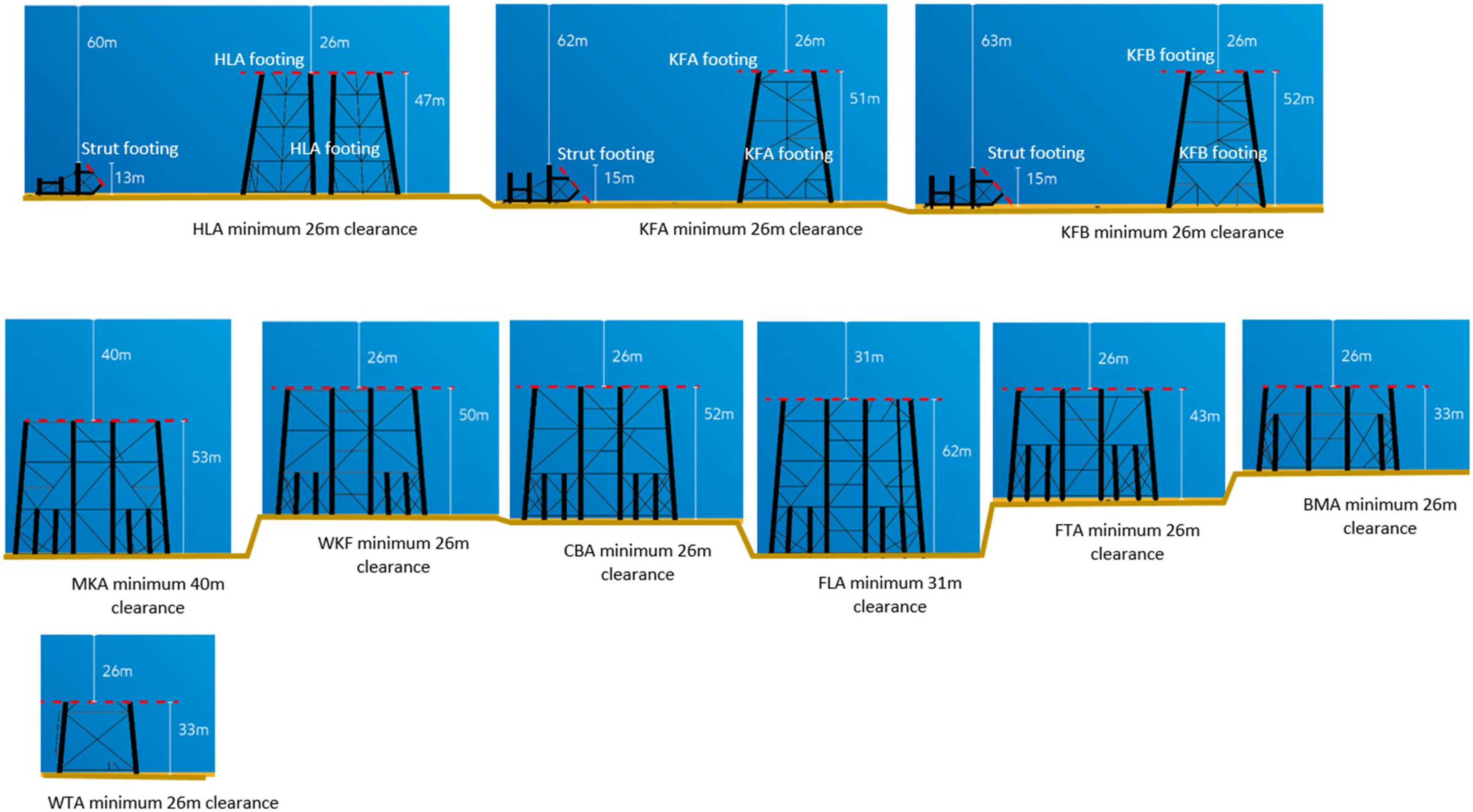


Figure 3-14 **Option F – Lower section left in place with cut line to achieve a minimum clearance of 26 metres below mean sea level. Strut footings at Halibut, Kingfish A and Kingfish B will be cut at a practical location with a minimum clearance of 26 metres**

3.2.6 Summary of Options Feasibility Assessment

Table 3-5 provides a summary of the end state options assessed as feasible (and hence taken forward for assessment of environmental impacts and risks) following the completion of the Options Feasibility Assessment and the applicability to each Campaign #1 SPJ.

Table 3-5 Feasible SPJ end state options

Facility	End state option applicability to each SPJ				
	BASE CASE Option C: SPJ deep foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	**Option D:** Lower section of SPJ (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	**Option E:** Lower section of SPJ (including strut footings where present) left in place, with cut line to achieve a minimum clearance of 55m below MSL	**Option E plus seabed placement:** Option E plus placement on the seabed of some removed section(s)– cut to ensure a minimum 55m clearance below MSL	**Option F:** Lower section of SPJ (including strut footings where present) left in place, with cut line to achieve a minimum clearance of 26m below MSL
Halibut (HLA)	Yes	Yes	Yes	Yes	Yes
Kingfish A (KFA)	Yes	Yes	Yes	Yes	Yes
Kingfish B (KFB)	Yes	Yes	Yes	Yes	Yes
Mackerel (MKA)	Yes	Yes	Yes	Yes	Yes – 40m below MSL
West Kingfish (WKF)	Yes	Yes	Yes	Yes	Yes
Cobia (CBA)	Yes	Yes	Yes	Yes	Yes
Flounder (FLA)	Yes	Yes	Yes	Yes	Yes – 31m below MSL
Fortescue (FTA)	Yes	Yes	Yes	N/A (insufficient water depth)	Yes
Bream A (BMA)	Yes	Yes	N/A (cut depth equivalent to Option D)	N/A (insufficient water depth)	Yes
Whiting (WTA)	Yes	Yes	N/A (insufficient water depth)	N/A (insufficient water depth)	Yes

3.3 Environmental impacts and risks evaluation of feasible options

Consistent with NOPSEMA's 572 policy (NOPSEMA, 2022c), an evaluation of the environmental impacts and risks of feasible end state options was undertaken. The results of this evaluation are presented in this Section of the EP.

The environmental impact and risk evaluation of the feasible end state options was undertaken in accordance with the methodology described in Section 7 of this EP.

Environmental impacts are defined as resulting from activities that are *reasonably certain* to occur (e.g. planned discharges to water or air), while environmental risks result from unplanned events that may occur (such as other users of the sea interacting with infrastructure decommissioned in place etc.).

As discussed in Section 3.2.4.1, complete removal of the SPJ's (which includes removal of deep foundation piles underneath the seabed) was assessed as not feasible. Hence the environmental impacts and risks of 'complete removal' as described by Option B have not been assessed. Option C – cut line below the seabed (large scale dredging assumed to be required) – has been assessed as the closest feasible option to complete removal and as such has been used as the 'base case' for the purposes of the EOBO Assessment.

3.3.1 Supporting studies

In order to inform the environmental impact and risk evaluation of the feasible options, the following studies were reviewed, along with a number of peer reviewed scientific papers (which are referenced throughout the EP). The key studies used to inform the impacts and risks assessment of the feasible options are presented in Table 3-6.

Table 3-6 Summary of key studies used to inform impacts and risks evaluation

Date	Study title	Author	Scope overview
March 2021	*Ecological Assessment from Industrial Remotely Operated Vehicle (ROV) Inspection Footage: Platforms & Pipelines Lookbook* (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021a)	Deakin University	Study assessed over 1000 hours of historical ROV imagery captured during routine inspection and maintenance of oil and gas infrastructure in the Bass Strait from 2008-2018. The study provides site specific data on habitats and marine flora and fauna associated with the oil and gas infrastructure.
August 2021	*Marine biota associated with oil and gas infrastructure off the Gippsland coast* (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b)		
December 2021	*Environmental Media Report – Gippsland Basin Decommissioning State of the Environment* (AECOM Australia Pty Ltd, 2021)	AECOM	Study provides the results of sediment chemistry and infauna analysis from samples collected around Esso infrastructure during Environmental Survey 1 (Summer) undertaken February to March 2021.

Date	Study title	Author	Scope overview
February 2022	*Catch, value and relative risk of commercial fisheries operating around Esso Australia's Eastern Bass Strait field* (SETFIA, 2022)	South East Trawl Fishing Industry Association (SETFIA)	Study identifies and describes commercial fishing relevant persons in Bass Strait and outlines potential impacts and risks to the commercial fishing industry as a result of the Esso infrastructure.
February 2022	*Results of the Contaminant Levels Survey in the Marine Environment of the Gippsland Basin* (Hook S. E., et al., 2022)	Hook S.E., et al, 2022	Study provides the analysis of sediment samples collected as part of Environmental Survey 1 (Summer) undertaken February to March 2021. Concentrations of metals and PAHs around sampled Esso infrastructure was compared with reference areas and contaminant screening values.
February/April 2022	Potential Impacts Posed by different Decommissioning Scenarios: Commercial Shipping (AMC Search, 2022a) (AMC Search, 2022b)	Australian Maritime College (AMC) Search	Study investigated the impacts and potential risks of different Bass Strait decommissioning options on commercial vessels.
February/April 2022	Potential Impacts Posed by different Decommissioning Scenarios: Commercial Fishing (AMC Search, 2022c)	AMC Search	Study investigated the impacts and potential risks of different Bass Strait decommissioning options on commercial fishers.
March 2022	*Decommissioning Literature Review* (Advisian, 2022)	Advisian	Study was an update to *Scientific Literature Review – Environmental Impacts of Decommissioning Options* (Advisian, 2017) prepared for Australian Petroleum Production & Exploration Association Ltd (APPEA). The report is a review of research literature published post 2016 to complement the Advisian (2017) report.
May 2022	*Marine Communities of Platform Facilities, Subsea Pipelines and Surrounding Natural Ecosystems in the Gippsland Region, south-east Australia* (AIMS, 2022a)	Australian Institute of Marine Science (AIMS)	Study assessed the visual data collected during Environmental Survey 1 (Summer) undertaken February to March 2021. Study provides site specific baseline data on habitats and marine flora and fauna associated with the Esso infrastructure around which visual data was collected.

Date	Study title	Author	Scope overview
June 2022	*Gippsland Decommissioning Project Campaign 1, SPJ – Rate of Degradation Study* (Kent Plc, 2022)	Kent Plc	Study investigated the degradation of the SPJ steel constituents and anodes. An Environmental Impact Assessment was also conducted, which calculated potential concentrations of metal leached from the degrading structures and compared to guideline values. Potential impacts to marine biota and habitats were also assessed as a result of eventual structure collapse.

3.3.2 Impacts and risks evaluation of feasible options

The impact evaluation of the feasible decommissioning options is presented in Table 3-7 and the risk evaluation of the feasible decommissioning options is presented in Table 3-9. Relevant person feedback received as part of the consultation process was considered in completing these assessments.

When assessing the impacts and risks of SPJ decommissioning options, it was established that there was a commonality of outcomes assessed for individual SPJs. Table 3-7, Table 3-8 and Table 3-9 provide a consolidated overview of the impacts and risks respectively as assessed for all SPJs. Where there are differentiating factors for particular SPJs or end states, these have been individually noted.

SPJ specific differentiators include:

- Exclusion of Option E for BMA and WTA due to shallower water depth
- Exclusion of consideration of seabed placement for BMA, WTA and FTA due to inadequate water depth
- SPJ specific construction differences such as the presence or absence of anodes or strut footings
- SPJ location specific environmental factors such as any geographic overlap of biologically important areas

End State specific differentiators include:

- Differing extent of wastes for onshore processing and disposal
- Differing extent of execution emissions based on assumed associated work effort.
- Differing levels of seabed disturbance based on associated execution methodologies (i.e. dredging)

Consideration of potential cumulative impacts as a result of concurrent ongoing platform (production and well) operations and execution of removal activities is included in Table 3-8.

Table 3-7 Impact evaluation – Feasible end state options

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
Impacts to other users of the sea								
Impacts to users of the sea through the continuing physical presence of remaining SPJs.	Physical presence of SPJs remaining in place requires **commercial vessels** to continue to be diverted from direct transit over SPJs, resulting in incremental transit time.	Long term (years)	Remaining structures will be marked on navigational charts including any sections of removed SPJs if placement option selected. Placement will be within the title boundary and as close as practicable to the lower SPJ sections remaining in place.	**No impact**	**No impact**	**No impact**	**No impact**	**Consequence Level IV** Inconsequential or no adverse effects.
				This Option will remove SPJs to below the seabed and hence will not require any commercial vessels to divert from direct transit. Commercial vessels may benefit from this option if the "Area to Be Avoided" (ATBA) is removed from marine nautical charts. Improvement for commercial shipping in reduced transit time/distance when transiting Bass Strait, or working for other industries in the areas (e.g. Offshore Wind area).	Commercial vessels are able to choose the most direct route between Wilsons Promontory and Cape Howe in the event current shipping controls in place around the Esso operational facilities are removed in the future – the clearance provided over the remaining structures has been assessed as adequate even under severe weather events and for the largest commercial vessels to transit Bass Strait (AMC Search, 2022a). Commercial vessels may benefit from this option if the ATBA is removed.	Commercial vessels are able to choose the most direct route between Wilsons Promontory and Cape Howe in the event current shipping controls in place around the Esso operational facilities are removed in the future – the clearance provided over the remaining structures has been assessed as adequate even under severe weather events and for the largest commercial vessels to transit Bass Strait (AMC Search, 2022a). Commercial vessels may benefit from this option if the ATBA is removed.	Removed sections will be cut and placed to ensure a minimum 55m clearance below MSL. Impacts consistent with Options C, D and E. Commercial vessels may benefit from this option if the ATBA is removed.	Large commercial vessels may have an effective clearance sufficiently deep to potentially collide with remaining SPJs in severe weather/wave conditions. Hence large commercial vessels may need to continue to avoid the area and be prevented from taking the most direct route from Wilsons Promontory to Cape Howe, if the ATBA and TSS are removed in the future. Deviation of transit routes of commercial vessels around SPJ locations would result in addition to sail time, estimated to be 13 minutes per transit (AMC Search, 2022a).
	Physical presence of SPJ's remaining in place requires ongoing exclusion of **commercial fishing** from the immediate vicinity of the SPJs. Commonwealth bottom- and mid-water trawling and Danish seine method.	Long term (years)	Remaining structures will be marked on navigational charts including any sections of removed SPJs if placement option selected. Placement will be within the title boundary and as close as practicable to the lower SPJ sections	**No impact**	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				This Option will remove the SPJs to below the seabed. It is assumed that potential future commercial fishing operations will not be displaced from the SPJ locations once natural processes have sufficiently replenished any dredged areas and buried any exposed piles below the cut line.	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. It is possible that some SPJs may be completely cut off below seabed and therefore not present a long-term snagging hazard to commercial fishing gear however for the purpose of impact assessment, a worst-case basis of some structure (up to ~5m) remaining above	Impacts of this Option have been assessed as consistent with Option D, as remaining lower sections of SPJs will not be over trawlable.	Impacts of this Option have been assessed as consistent with Option D, as seabed placed sections of SPJs will not be over trawlable. Commercial fishing would be excluded from a small incremental (to Option D) area of seabed under this Option (the footprint of the placed sections) – however it is assumed that sections will be placed as close as practicable to the SPJ lower sections, thus reducing the area	Impacts of this Option have been assessed as consistent with Option D, as remaining lower sections of SPJs will not be over trawlable.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
			remaining in place.	Estimated dredge volumes on an individual facility basis are included in Appendix A6.	seabed is assumed for all SPJs. Remaining structures will not be over trawlable and therefore have the potential to damage fishing equipment if snagging occurred. Commercial fishing operations would need to continue to avoid SPJ locations. The Commonwealth demersal/mid-water trawl and Danish seine fisheries collectively account for a significant portion of the catch in the Gippsland Basin. Combined catch and revenue were identified to be on average ~1000t and ~$5.7M per year (SETFIA, 2022). This Option results in no reduction or impact to the currently available fishable area, however the presence of the remaining SPJ's will result in the long-term exclusion of commercial fishing from the SPJ locations. The area currently excluded from fishing at each SPJ (including the current 500m exclusion zone) is approximately 0.8km^2 per SPJ. By comparison, the total extent of the Gippsland Basin is approximately 30,000km^2. Impacts are limited to the vicinity of the remaining SPJ locations and are expected to be inconsequential.		which is unavailable for commercial fishing to a small vicinity around each remaining SPJ.	
	Physical presence of SPJs remaining in place requires	Long term (years)	Remaining structures will be marked on	**No impact**	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	ongoing exclusion of **commercial fishing** from the immediate vicinity of the SPJs. Commonwealth long line and gillnet, hook, jig and trap fishing methods.		navigational charts. Placement will be within the title boundary and as close as practicable to the lower SPJ sections remaining in place	This Option will remove the SPJ to below the seabed. It is assumed that potential future commercial fishing operations will not be displaced from the SPJ locations once natural processes have sufficiently replenished any dredged areas.	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. For the purpose of assessing impacts to other marine users, an assumption has been made that some structure (up to ~5m) will remain above the seabed for all SPJs. Remaining structures have the potential to damage long line and fishing equipment. Fishing operations would need to continue to avoid the immediate area around SPJ locations. The assessed impact reflects the lower prevalence of these fishing methods in the Gippsland Basin. Combined catch and revenue were identified to be on average ~140t and ~$1M per year (SETFIA, 2022). This Option results in no reduction or impact to current fishable area, however the presence of remaining SPJs will result in the long-term exclusion of commercial fishing from the SPJ locations. Impacts are limited to the vicinity of the remaining SPJs and are expected to be inconsequential.	Impacts of this Option have been assessed as consistent with Option D, as remaining lower sections of SPJs will not be over trawlable.	Impacts of this Option have been assessed as consistent with Option D, as seabed placed sections of SPJs will not be over trawlable. Commercial fishing would be excluded from a small incremental (to Option D) area of seabed under this Option (the footprint of the placed sections) – however it is assumed that sections will be placed as close as practicable to the SPJ lower sections, thus reducing the area which is unavailable for commercial fishing to a small vicinity around each remaining SPJ.	Impacts of this Option have been assessed as consistent with Option D.
	Physical presence of SPJs remaining in place requires	Long term (years)	Remaining SPJs will be marked on	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	ongoing exclusion of **commercial fishing** from the immediate vicinity of the SPJs. State fisheries including but not limited to purse seine, rock lobster, scallop, octopus and general ocean fisheries.		navigational charts. Placement will be within the title boundary and as close as practicable to the lower SPJ sections remaining in place.	This Option will remove the SPJs to below the seabed. It is assumed that potential future commercial fishing operations will not be displaced from the SPJ locations once natural processes have sufficiently replenished any dredged areas. It is recognised that while this Option does not displace these fishing methods in the future, complete removal of the SPJ above the seabed may not benefit the Rock Lobster Fishery. Small numbers of rock lobsters were observed in the Environmental Survey 1 (Summer) ROV footage from CBA, HLA and KFA. Removal of the SPJs to below the seabed will likely eliminate these local populations, however, this impact is not expected to have any adverse effects on regional populations.	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. It is possible that some SPJs may be completely cut off below seabed and therefore not present a long-term snagging hazard to commercial fishing gear. However for the purpose of assessing impacts to other marine users, an assumption has been made that some structure (up to ~5m) will remain above the seabed for all SPJs. Remaining structures have the potential to damage a range of equipment including during anchor/ballast drops. Fishing operations would need to continue to avoid the immediate area around former SPJ locations. Combined catch and revenue were identified to be on average ~1550t and ~$5.5M per year (SETFIA, 2022). This Option results in no reduction or impact to current fishable area. The presence of remaining SPJs however will result in the long-term exclusion of commercial fishing from the SPJ locations. Impacts are limited to the vicinity of the remaining SPJs and impacts are expected to be inconsequential. The Rock Lobster Fishery may broadly benefit from the retention of some reef like habitat and existing breeding	Impacts of this Option have been assessed as consistent with Option D as remaining lower sections of SPJs will not be over trawlable.	Impacts of this Option have been assessed as consistent with Option D, as seabed placed sections of SPJs will not be over trawlable. Commercial fishing would be excluded from a small incremental (to Option D) area of seabed under this Option (the footprint of the placed sections) – however it is assumed that sections will be placed as close as practicable to the SPJ lower sections, thus restricting the area which is unavailable for commercial fishing to a small vicinity around each remaining SPJ.	Impacts of this Option have been assessed as consistent with Option D.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
					populations and contributing to broader recruitment.			
	Physical presence of SPJs remaining in place results in interference to **recreational fishing activities** in the area.	Long term (years)	Remaining structures will be marked on navigational charts. Placement will be within the title boundary and as close as practicable to the lower SPJ sections remaining in place.	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects.	**No impact** Benefit.	**No impact** Benefit.	**No impact** Benefit.
				Under this Option the SPJ is removed to below the seabed and recreational fishers will lose the fish attracting habitat available in Options E and F.	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised that some structure may remain under this Option (up to ~5m), the maximum removal to below the seabed has been assumed for the purpose of assessing impacts to recreational fishing. Impacts of this Option have been assessed as consistent with Option C.	Impacts of this Option have been assessed as consistent with Option F.	Impacts of this Option have been assessed as consistent with Option F. Placement of sections of the removed SPJs on the seabed will provide additional fish habitat which is potentially available to recreational fishers.	No negative impact to Recreational fishing identified. Recreational fishing may benefit from increased access to fishing locations around the remaining SPJs and remaining fish attracting habitat. This Option results in the greatest benefit to recreational fishing resulting from the highest retention of habitat.
	Physical presence of SPJs remaining in place results in the exclusion of other **potential future industries** (e.g. wind power) from the immediate location of the SPJs.	Long term (years)	Remaining structures will be marked on navigational charts. Placement will be within the title boundary and as close as practicable to the lower SPJ sections remaining in place.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Remaining SPJs would not preclude the installation of future assets by other parties within the region but may displace installation locations by short distances (perhaps several hundred metres) to avoid interaction with the remaining deep foundation piles. The area of displacement is very small in the context of the total area available within the Gippsland Basin.	Impacts of this Option have been assessed as consistent with Option C. Anchoring or subsea equipment being towed from vessels will need to avoid the remaining SPJ locations. The area of displacement is very small in the context of the total area available within the Gippsland Basin.	Impacts of this Option have been assessed as consistent with Option C. Anchoring or subsea equipment being towed from vessels will need to avoid the remaining SPJ locations. The area of displacement is very small in the context of the total area available within the Gippsland Basin.	Impacts of this Option have been assessed as consistent with Option C. It is assumed that sections would be placed as close as practicable to the SPJ lower sections, thus minimising the area which is unavailable for the use of potential future marine industries. Anchoring or subsea equipment being towed from vessels will need to avoid the remaining SPJ locations. The area of displacement is very small in the context of the total area available within the Gippsland Basin.	Impacts of this Option have been assessed as consistent with Option C. Anchoring or subsea equipment being towed from vessels will need to avoid the remaining SPJ locations. The area of displacement is very small in the context of the total area available within the Gippsland Basin.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	Reduction in SPJ leads to reduction in fish habitat, leading to a reduction in **commercial fishing catch (through loss of productivity/ connectivity)**	Long term (years)	Further studies are being undertaken by AIMS to better define potential impacts on the productivity and connectivity for selected species.	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				The SPJs provide habitat that supports a higher abundance and richness of fish compared to the surveyed reference sites within the Gippsland Basin. Globally, there is evidence for O&G structures facilitating vertical and horizontal seascape connectivity for larvae and mobile adult invertebrates, fish and megafauna; including threatened and commercially important species (McLean, et al., 2022). The Environmental Survey 1 (Summer) imagery identified 20 fish species that are targeted by recreational and/or commercial fishers (AIMS, 2022a). The impact to fisheries of partial removal options or options that remove SPJs to below the seabed will depend on the level of connectivity between the SPJs and surrounding areas and the extent to which fish production sourced from the SPJs contribute to the broader Bass Strait fisheries. It has been assessed for the purpose of this impact assessment that complete removal of the habitat currently provided will have a minor impact.	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised that some structure may remain under this Option (up to ~5m), the maximum removal to below the seabed has been assumed for the purpose of assessing this impact. Impacts of this Option have been assessed as consistent with Option C.	Impacts of this Option have been assessed as consistent with Option F.	Impacts of this Option have been assessed as consistent with Option F. The placement of removed sections of the seabed will provide additional hard substrate habitat to support demersal fish species.	This Option results in the lowest disturbance to habitat and is considered not likely to have a negative impact on commercial fishing catch within the Gippsland Basin. Based on the extent of structure retention, this Option may provide the most benefit.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	Physical presence of SPJ's remaining in place requires **Naval vessels (including submarines)** to continue to be diverted from direct transit over or around SPJs	Long term (years)	Remaining structures will be marked on navigational charts including any sections of removed SPJs if placement option selected. Placement will be within the title boundary and as close as practicable to the lower SPJ sections remaining in place.	No impact identified to date through consultation process.				
	Physical presence of SPJ's remains in an area of ongoing interest in to **Traditional Owners**	Long term (years)	No controls identified.	There are no Native Title claims in relation to any of the SPJ OAs. The relationship of the Gunaikurnai people with sea environments continues due to its cultural significance and use as an ongoing resource (Gunaikurnai Land and Waters Aboriginal Corporation, 2015). The connection of the Gunaikurnai people to Sea country is recognised. No impacts to this cultural value have been identified through the consultation process.				
	Physical presence of SPJ's remains in an area of ongoing interest in to **Unions**	Long term (years)	No controls identified.	It is recognised that Unions have an interest in the matters relevant to the operation and execution of decommissioning of the SPJs. Since the commencement of production in 1969, Esso's Bass Strait operations have provided employment opportunities for local and national Australian industries, skills training and the establishment of local supply chains. This has, and continues to deliver value to Australian, Victorian and local Gippsland communities and economies, both directly and indirectly. This EP outlines the first of many scopes that are required to decommission the Bass Strait facilities. While these scopes will progressively be submitted for acceptance under subsequent EPs, we forecast the need for supplies and resources for at least the next 20 years and will employ policies, procedures and initiatives to promote the development of Victorian and Australian suppliers. Esso's decommissioning activities will therefore continue to deliver benefit to Australian economies for many years to come. Feedback received was considered in relation to the preparation of this EP (refer Section 6).				
	Physical presence of SPJ's remains in an area of ongoing interest to **Environmental**	Long term (years)	Controls addressed against applicable environmental aspects based	It is recognised that eNGOs have an interest in the environment matters relevant to the Gippsland Basin including SPJ OAs. Assessed impacts to environmental aspects are detailed further in following sections of this table. Feedback received has been considered in relation to the preparation of this EP (refer Section 6).				

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	Non-Governmental Organisations (eNGOs)		on feedback received.					
Impacts to marine flora and fauna								
Impacts to marine biota through the loss or modification of SPJ habitats.	Local loss of abundance and diversity of **sessile organisms** (fixed to the SPJ) through reduction in SPJ height.	Long term (years)	No controls identified.	**Consequence Level II** Significant adverse effects.	**Consequence Level II** Significant adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects.	Consequence Level IV Inconsequential or no adverse effects.
				Observations during Environmental Survey 1 (Summer) have confirmed that the SPJs support a greater abundance of sessile organisms than observed at surrounding reference and natural reef locations. This Option results in the greatest extent of loss of sessile organisms with all of the encrusting biota and associated mobile organisms (including crustaceans) present on the structure lost when the SPJ is removed and taken onshore for dismantling and disposal. Variations in the colour combinations of encrusting jewel anemones were observed between SPJs. Examples are included in Section 8.4.2.2.	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised that some structure (up to ~5m) may remain under this Option, the maximum removal to below the seabed has been assumed for the purpose of assessing impacts to sessile organisms. Impacts of this Option have been assessed as consistent with Option C.	This Option retains many of the encrusting species (including jewel anemones) and most sponges for the SPJs. The assessed impact recognises that removal of the upper portion of the SPJs may change the ecological dynamics of the remaining structures (reduced fish attraction, altered nutrient cycle, light penetrations and protective habitat for some species, etc.).	Placement of removed upper sections of some SPJs on the seabed will provide additional hard substrate on the seabed for colonisation by sessile organisms. Upon placement there will be a change in the encrusting sessile organism from those present in the upper water column to more depth tolerant species. Time for this transition will be typically within the first year or two of placement.	This Option results in the lowest extent of removal of sessile organisms and retains the majority of encrusting jewel anemones and sponges. The changes in species composition will be least for this option when compared to the other options.
	Local loss of abundance and diversity of **fish and other mobile** organisms through reduction in	Long term (years)	No controls identified.	**Consequence Level II** Significant adverse effects	**Consequence Level II** Significant adverse effects	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects height.	**Consequence Level IV** Inconsequential or no adverse effects
				Observations during Environmental Survey 1 (Summer) have identified a total of 69 taxa of fish and confirmed that the SPJs	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised	The assessed impact recognises that removal of the upper portion of the SPJs may change the ecosystem of the remaining structures (reduced	Placement of removed upper sections of some SPJs on the seabed will provide additional hard substrate on the seabed to	A study of the impacts from partial removal (to -26m) of platforms in California assessed that on average, 80% of fish biomass and 86% of secondary

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	habitat provided by the SPJs.			support a greater abundance of fish than observed at surrounding reference and natural reef locations. Based on the extent of removal under this Option, the alteration to the observed abundance and diversity of local fish populations is expected to be significant.	that some structure (up to ~5m) may remain under this Option, maximum removal to below the seabed has been assumed for the purpose of assessing impacts to fish and other mobile species. Impacts of this Option have been assessed as consistent with Option C.	fish attraction, altered nutrient cycle, light penetrations and protective habitat for some species, etc.). The extent of potential impact would vary between SPJs. The overall impact across all of the SPJs is considered minor.	provide habitat for fish and other mobile organisms.	fish production would be retained after partial removal to 26m clearance, with above 90% retention expected for both metrics on many platforms (Claisse, et al., 2015).
	Local loss of abundance and diversity of unidentified sponge species observed in water depths greater than 60m.	Long term (years)	No controls identified.	**Consequence Level II** Significant adverse effects	**Consequence Level II** Significant adverse effects	**Consequence Level IV** Inconsequential or no adverse effects	**Consequence Level IV** Inconsequential or no adverse effects	**Consequence Level IV** Inconsequential or no adverse effects
				Observations during Environmental Survey 1 (Summer) identified that the base/lower sections of the SPJs appear to have the greatest diversity of benthic biota, including several unidentified sponge species. Identification is limited based on the available published taxonomic research on sponges found at depth within the Gippsland Basin. The observed sponge gardens at the bases of the SPJs appear diverse and well established with many mobile organisms sheltering and living among them (crabs, fish etc.) (AIMS, 2022a). Complete removal of the SPJ will result in the loss of all attached sponges and the loss of future opportunities for the ecological or taxonomic study of this group of organisms.	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised that some structure (up to ~5m) may remain under this Option, maximum removal to below the seabed has been assumed for the purpose of assessing impacts to sponge species. Impacts of this Option have therefore been assessed as consistent with Option C.	As most sponges have been observed at depths greater than 60m, this Option is expected to have inconsequential impacts on the observed sponge species or assemblages. This Option retains many of the encrusting sponges for the SPJs	As most sponges have been observed at depths greater than 60m, this Option is expected to have inconsequential impacts on the observed sponge species or assemblages, and could enhance the biomass of these assemblages by increasing the area of hard substrate. This Option retains many of the encrusting sponges for the SPJs	As most sponges have been observed at depths greater than 60m, this Option is expected to have inconsequential impacts on the observed sponge species. This Option retains many of the encrusting sponges for the SPJs.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	Reduction in SPJ height leading to behavioural changes in identified endangered species **(white shark** (*Carcharodon carcharias*)) as a result of changes to current food sources.	Long term (years)	No controls identified.	**Consequence Level III –** Minor adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects
				The white shark is currently listed as Endangered. One white shark was observed by the ROV near WTA during the Environmental Survey 1 (Summer). Identified foraging areas, aggregation areas, and sites to which white sharks return on a regular basis may represent habitat critical to the survival of the species (DSEWPC, 2013). All SPJ locations fall within white shark distribution areas. No SPJs fall within known biologically important foraging areas. Known high density foraging sites for white sharks are mostly around seal and sea lion colonies (DSEWPC, 2013) Given the presence of seals on the SPJs it is not unexpected that white sharks may also occasionally be present around the SPJs There is a biologically important breading /nursery area for the white shark that overlaps with the BMA OA (refer Figure 5-18). Juvenile great white sharks appear to aggregate seasonally between Corner Inlet and Ninety Mile Beach, and this is considered a shark nursery area (DSEWPC, 2013). White sharks are a transient species and are only temporary residents in the areas they inhabit; however, given they return on	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised that some structure (up to ~5m) may remain under this Option, maximum removal to below the seabed has been assumed for the purpose of assessing impacts to the white shark. Impacts of this Option have therefore been assessed as consistent with Option C.	Under this Option, local fish populations and Australian fur seal behaviour will alter but to a lesser extent than Option C. This option will provide some ongoing foraging opportunities The exclusion zone around remaining SPJs may offer some protection from incidental capture in fishing gear (McLean, et al., 2022) as well as foraging opportunities that are lost with Options C and D.	Placement of removed upper sections of some SPJs on the seabed will provide additional hard substrate on the seabed to provide habitat for fish and possible foraging opportunities. The exclusion zone around remaining SPJs may offer some protection from incidental capture in fishing gear (McLean, et al., 2022) as well as foraging opportunities that are lost with Options C and D.	Under this Option, local fish populations and Australian fur seal behaviour will alter but to a lesser extent than Option C. The exclusion zone around remaining SPJs may offer some protection from incidental capture in fishing gear (McLean, et al., 2022) as well as foraging opportunities that are lost with Options C and D. This is the only option that retains a significant portion of the BMA structure.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				seasonal or more regular basis this implies a degree of site fidelity (Bruce, Stevens, & Bradford, 2005). There is evidence to suggest that both males and females are philopatric and may return to their birthplace for breeding (Blower, Pandolfi, Bruce, Gomez-Cabrera, & Ovenden, 2012). As such, the breeding/nursery area intersected by BMA may provide important habitat for the species. The 500m exclusion zone around BMA represents only a small portion of the total nursery area in this region. Due to the extent of removal under this Option, localised changes in food source distribution (especially fur seal) may result in changes in white shark behaviour and distribution within the region.				
	Reduction in SPJ height leading to changes to food source location and abundance for **Australian fur seals** (protected), resulting in changes in behaviour and distribution.	Long term (years)	No controls identified.	**Consequence Level II** Significant adverse effects.	**Consequence Level II** Significant adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects.
				The Australian fur seal is a protected species that was hunted to the edge of extinction in the 19th century. Population sizes are now increasing (Department of Environment, Land, Water and Planning, 2018). The Australian fur seal has a relatively restricted distribution around the islands of Bass Strait, parts of Tasmania and southern Victoria. They can be seen hauling out on islands off South Australia and areas of southern New South Wales	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised that some structure (up to ~5m) may remain under this Option, maximum removal to below the seabed has been assumed for the purpose of assessing impacts to the Australian fur seal. Under this Option, Australian fur seals will lose haul-out opportunities and fish foraging habitat. Fish will no longer	Under this Option, Australian fur seals will lose haul-out opportunities. Deeper demersal fish foraging habitat is retained for any seals that may continue to visit the SPJs for foraging. A smaller reduction in overall fish populations compared to Options C and D as a result of this Option is expected to occur.	Under this Option, Australian fur seals will lose haul-out opportunities however deeper demersal fish foraging habitat is retained for any seals that may continue to visit the SPJs for foraging. A smaller reduction in overall fish populations compared to Options C and D as a result of this Option is expected to occur.	Under this Option, Australian fur seals will lose haul-out opportunities however will retain deeper demersal fish foraging habitat. The limited habitat removal in this Option is expected to result in a minimal overall reduction in local fish populations. A study of the impacts from partial removal (26m clearance) of platforms in California assessed that on average, 80% of fish biomass and 86% of secondary fish production would be retained after partial removal (26m clearance), with above 90%

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				(The Australian Museum, 2022). Masses of Australian fur seals are frequently observed by Bass Strait platform operators and have been observed in review of historical ROV footage. The Australian fur seal is a benthic foraging species that feeds on a wide variety of demersal fish and cephalopod species. A 2015 study (Arnould, et al., 2015) on individuals from the Kanowna Island colony observed that the presence of anthropogenic structures (including oil and gas infrastructure) in Bass Strait appear to be providing a geographic link to valuable prey habitat for fur seals. Under this Option, Australian fur seals will lose haul-out opportunities and fish foraging habitat. Fish will no longer aggregate at the SPJs and will disperse to broader Gippsland Basin or be lost due to unavailable habitat. The extent of alteration could drive long-term changes in seal behaviour across the Gippsland Basin.	aggregate at the SPJs and will disperse to broader Gippsland Basin and seal foraging behaviour will need to adjust accordingly. Impacts of this Option have therefore been assessed as consistent with Option C.			retention expected for both metrics on many platforms (Claisse, et al., 2015).
	Reduction in SPJ height leading to changes in food source location and abundance resulting in changes to the distribution of **open water pelagic species**	Long term (years)	No controls identified.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				There are various open water pelagic species that may occur in the Gippsland Basin. A number of these species are EPBC listed, including but not limited to the	Impacts of this Option have been assessed as consistent with Option C.	Impacts of this Option have been assessed as consistent with Option C.	Impacts of this Option have been assessed as consistent with Option C.	Impacts of this Option have been assessed as consistent with Option C.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	(including EPBC Act-listed species).			Southern right whale (*Eubalaena australis*) and blue whales (*Balaenoptera musculus*). Species such as the Southern right whales and blue whales are also subject to Conservation Management Plans. Changes directly associated with the end state of the SPJs are considered unlikely to have a measurable impact on overall populations of any open water pelagic species as these species have a broad feeding and migration range.				
	Reduction in SPJs leading to a cumulative reduction in Gippsland Basin **ecosystem richness and diversity** (*based on literature).	Long term (years)	No controls identified.	**Consequence Level II** Significant adverse effects.	**Consequence Level II** Significant adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Oil and gas platforms off the coast of California have the highest secondary fish production per unit area of seabed of any other studied marine habitat (Claisse, et al., 2014). A plankton study around nine offshore platforms (including BMA, CBA, FTA, FLA, HLA and MKA) in Bass Strait documented a diversity of larval and early-stage juvenile fishes (Neira, 2005). Observations during the Environmental Survey 1 (Summer) confirmed that the SPJs support thriving communities. The structures are covered in marine life, including anemones and sponges and support many more species at different trophic levels and greater abundance of marine biota than that observed at	Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised that some structure (up to ~5m) may remain under this Option, maximum removal to below the seabed has been assumed for the purpose of assessing impacts to the Bass Strait ecosystem as a result of a loss of productivity and connectivity. Therefore, impacts of this Option have been assessed as consistent with Option C.	The assessed impact recognises that removal of the upper portion of the SPJs will change the ecological dynamics of the remaining structures (reduced fish attraction, altered nutrient cycle, light penetrations and protective habitat for some species, etc.). The extent of potential impact would vary between SPJs. The overall impact across all of the SPJs is considered minor.	The assessed impact recognises that removal of the upper portion of the SPJs may change the ecological dynamics of the remaining structures (reduced fish attraction, altered nutrient cycle, light penetrations and protective habitat for some species, etc.). Placement of some removed sections of the SPJs will provide additional hard substrate on the seabed which will be colonised as habitat. Hence impacts of this Option may be less than Option E (but still minor).	It is considered that this Option will result in the least impact to ecosystem richness and diversity as the greatest extent of the SPJ is retained. Claisse et al. (2015) examined how secondary fish production would change under different decommissioning scenarios and found that partial removal of platforms did reduce fish production, but not to a large extent.

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				surrounding reference and natural reef locations. Studies at various man made structures globally have identified that as species become established on oil and gas structures, the structures and biota they support can become important source populations for supporting stocks in the broader environment (Thums, McLean, Ferreira, Benthuysen, & Miller, 2021). It is recognized that the nature and extent to which platform structures influence impacts is complex and further work is being undertaken to assess connectivity and productivity impacts associated with the removal of the Campaign 1 SPJs. Based on the extent of removal to below the seabed, this Option will result in significant alteration to the existing ecosystem communities through removal and disturbance .				
Seabed placement of some removed sections of SPJs.	Relocation of removed section(s) of jacket to deeper depths, resulting in local loss of abundance and diversity of biota due to change of habitat.	Long term (years)	No controls identified.	**N/A** No seabed placement.	**N/A** No seabed placement.	**N/A** No seabed placement.	**Consequence Level III** Minor adverse effects. Any placement of removed sections will be restricted to areas of sandy bottom seabed as close as practicable to the lower section of the SPJ from which it was removed. The assessed impact considers the initial local sediment disturbance, local loss of the sandy bottom infauna that will be directly crushed at the time of installation and displacement of fish and other sandy bottom	**N/A** No seabed placement.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
							species currently utilising areas where placement would occur.	
	Relocation of upper section(s) of SPJs to deeper depths, resulting in an increase in hard strata habitat for sessile and mobile marine biota.	Long term (years)	No controls identified.	**N/A** No seabed placement.	**N/A** No seabed placement.	**N/A** No seabed placement.	**No impact** Benefit. The assessment assumes that over time, species rich assemblages of sessile biota, fish, crustaceans and other marine life similar to that supported by the adjacent SPJ footings will establish. Placed sections will provide additional local foraging habitat and refuge from predation and fishing activities.	**N/A** No seabed placement.
Discharges to the sea								
Degradation of SPJs remaining in place.	Degradation of remaining SPJ **structural steel**, leading to iron and trace metals (chromium, copper, magnesium, nickel) dissolution into immediate waters and exposure to marine biota encrusted to SPJ or using the SPJ as habitat. Platform specific steel component mass estimates for materials remaining above and below the seabed are included in	Long term (years)	No controls identified.	**Consequence Level IV** Inconsequential or no adverse effects. Under this Option all of the SPJ above the seabed is removed and deep foundation piles remain. Degradation of those piles will be very slow (>2000 years) and given the location of the piles within the seabed, a receptor exposure pathway between any products of material degradation and marine biota is unlikely to exist. Dissolution of metals will be slow (>2000 years) and impacts to any organisms and predators that may be exposed are considered negligible.	**Consequence Level IV** Inconsequential or no adverse effects. Degradation of the SPJs will be a slow process and collapse will occur gradually over a very long period of time (estimated in the order of 500-1200 years for complete disintegration) (Kent Plc, 2022). All feasible end state options will remove the SPJ upper sections, so no materials associated with splash zone coatings/wraps or storage tanks would be present. The remaining SPJ sections are comprised of steel with some cement grout and sacrificial anodes remaining. Cement grout and anodes are assessed separately in this table.	**Consequence Level IV** Inconsequential or no adverse effects. Degradation of the SPJs will be a slow process and collapse will occur gradually over a very long period of time (estimated in the order of 500-1200 years for complete disintegration) (Kent Plc, 2022). As per Option C, dissolved metals concentrations from the surface of exposed steel have been conservatively estimated and were assessed to remain below applicable ANZECC (2018) water quality guidelines (Kent Plc, 2022). Dissolution of metals will be slow and impacts to encrusting organisms and predators that may be exposed are considered negligible.	**Consequence Level IV** Inconsequential or no adverse effects. The degradation of the steel constituents in the removed sections of the SPJs placed on the seabed is not expected to result in any incremental impacts to receptors above those assessed for Option E. No sections of SPJS with splash zone coatings/wraps or storage tanks will be placed on the seabed.	**Consequence Level IV** Inconsequential or no adverse effects. This Option retains the largest volume of materials in the environment however, as per Option C, dissolved metals concentrations from the surface of exposed steel have been conservatively estimated and were assessed to remain below applicable ANZECC (2018) water quality guidelines (Kent Plc, 2022). Dissolution of metals will be slow and impacts to encrusting organisms and predators that may be exposed at the point of release are considered negligible.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	Appendices A3 and A4.				This assessment has assumed the highest weight % of listed steel constituents across relevant steel grades for the consideration of environmental impact. Iron, the main constituent (~98%) of the SPJ is not considered a significant contaminant in the marine environment. Australian and New Zealand Environment and Conservation Council (ANZECC) water quality guidelines (ANZECC, 2018) provide marine water quality trigger levels for nickel, chromium and copper and estimated concentrations of these are predicted to be below applicable criteria (Kent Plc, 2022). Dissolution of metals will be slow and impacts to encrusting organisms and predators that may be exposed are considered negligible.			
	Degradation of remaining sacrificial anodes, leading to metals (aluminium, cadmium, copper, chromium, nickel, zinc) dissolution into immediate waters and exposure to marine biota encrusted to the SPJ or using the SPJ as habitat. Platform specific anode	Long term (years)	No controls identified.	**No impact**	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Under this Option, all sacrificial anodes will be removed.	HLA, KFA and KFB have no anodes and so there are no impacts associated with these SPJs. For the remaining SPJs, the timeframe to anode depletion has been estimated as less than 2.5 years (Kent Plc, 2022). The anode composition is mostly aluminium with minor cadmium, copper, chromium, nickel and zinc. Calculated concentrations of anode leachate in water (at 1cm) predicted concentrations to be	Calculated concentrations of dissolved metals are predicted to be below applicable ANZECC (2018) water quality guidelines. Impacts are consistent with those described for Option D. Dissolution of metals will be slow and impacts to encrusting organisms and predators that may be exposed are considered to be negligible.	Impacts of the degradation of sacrificial anodes under this Option are considered to be consistent with Option F, as the number of sacrificial anodes remaining in place will be similar.	This Option retains the largest volume of materials in the environment however estimated concentrations of dissolved metals are predicted to be below applicable ANZECC (2018) water quality guidelines. Impacts are consistent with those described for Option D. Dissolution of metals will be slow and impacts to encrusting organisms and predators that may be exposed are considered to be negligible.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	component mass estimates are included in Appendices A5.				below the most stringent (99% species protection) ANZECC (2018) water quality guidelines before any dilution occurs (Kent Plc, 2022). Cadmium is noted in ANZECC (2018) water quality guidelines as possible bioaccumulation however as the estimated concentrations are low, impacts to encrusting organisms and predators that may be exposed by bioaccumulation are considered negligible.			
	Degradation of **cement grout,** leading to constituent dissolution into immediate waters and exposure to marine biota encrusted to the SPJ or using the SPJ as habitat. Platform specific grout mass estimates are included in Appendices A2.	Long term (years)	No controls identified.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Under this Option all of the SPJs above the seabed are removed. Deep foundation piles and associated cement grout will remain. Degradation of those piles will be very slow (>2000 years) and given the location of the piles within the seabed, a receptor exposure pathway between any products of material degradation and marine biota is unlikely to exit. Dissolution of constituents will be slow and impacts to any organisms and predators that may be exposed are considered negligible.	Cement grout was used as an internal construction material in the SPJs. It is largely contained in the annulus between the various layers of steel at the base of the SPJs. Previous studies on the commencement of the disintegration of cement grout in seawater, indicate that some 200-300 years would be required for free chloride ion penetration into the cement grout to start the corrosion of embedded steel (Kent Plc, 2022). The inert chemical properties of the cement grout are not considered to have any ecotoxicological effect on the surrounding environment (Kent Plc, 2022).	Impacts of this Option are consistent with those assessed for Option D.	Impacts of this Option are consistent with those assessed for Option D.	Impacts of this Option are consistent with those assessed for Option D.
				No impact	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	Degradation of remaining SPJs, leading to gradual **disintegration and collapse** of the structures and associated smothering impacts to marine biota.	Long term (years)	No controls identified.		Inconsequential or no adverse effects.	Inconsequential or no adverse effects.	Inconsequential or no adverse effects.	Inconsequential or no adverse effects.
				Under this Option all of the SPJ above the seabed is removed.	Collapse of the remaining sections of the SPJs will occur gradually over a very long period of time. It is estimated that loss of minor structural components may commence in the range of 35-100 years however complete disintegration may take in the order of 500-1200 years (Kent Plc, 2022). The material degradation study (Kent Plc, 2022) predicted the footprint that may be affected if the remaining SPJ crumbles in on itself or if the structure falls to one side – termed the 'zone of influence'. Given the maximum height of any remaining SPJ under this Option is 5m, the zone of influence of this Option has been assessed as remaining within the current SPJ footprint (Kent Plc, 2022). Option D results in the smallest 'zone of influence' and the impact to marine biota as a result of smothering was assessed as inconsequential.	Impacts of this Option are consistent with those assessed for Option D. The material degradation study (Kent Plc, 2022) predicted the zone of influence for this Option would be restricted to the immediate SPJ footprint.	Given the height of the sections placed on the seabed would be consistent with Option D, the zone of influence once the placed sections have disintegrated and collapsed is considered to also be restricted to the immediate footprint of the placed sections. This would result in a small incremental area of impact to marine biota (infauna and sessile biota that cannot move away), however impacts to marine biota as a result of smothering are still considered to be inconsequential.	Under this Option, the 'zone of influence' is predicted to be larger due to the potential drift of falling steel from the higher elevation of the SPJ remaining in place and the potential for 'pushover collapse' from environmental loading. Collapse of the SPJ may happen instantaneously, or a piece of the SPJ may fall from the remaining structure, in which case the seabed habitat and the biota within the zone of influence would be smothered. However collapse of the SPJ is more likely to occur slowly, which would have little effect on the existing environment. Losses through crumbling of parts of the structure will be localised, gradual and the biological communities would adapt to the changing structure over time (RSK in (Kent Plc, 2022)).
Impact of activities to execute end state options								
Direct environmental emissions from dredging activities.	Impact of seabed dredging to environment – **smothering** of local infauna and benthic surrounds as part of dredging	Long term (years)	No controls identified.	**Consequence Level II** Significant adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**No impact**	**No impact**	**No impact**
				This Option assumes large scale seabed dredging is required to facilitate the cutting of 176 piles beneath the seabed. A total of	This Option assumes some dredging will be required in order to provide access to cut locations above the seabed where internal cutting is	No seabed dredging will take place as part of this Option.	No seabed dredging will take place as part of this Option.	No seabed dredging will take place as part of this Option.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	excavation for pile cutting causing biota mortality.			88,000m^3 of material is estimated to require dredging. Estimated dredge volumes on an individual facility basis are included in Appendix A6. Dredge spoil will be released to the environment and will result in the smothering of some of the immediate surrounds of each SPJ. A key ecological feature (KEF) known as the East of Eden Upwelling is located near the FLA SPJ. Dredging at FLA may result in impacts to the KEF. At the conclusion of the works, any resulting depressions in the seabed will be left to replenish sediment cover naturally over time. It is expected that replenishment would occur within a decade. The area of impact around each SPJ that would be subject to smothering would extend well beyond the SPJ footings. This Option would result in a significant alteration to the local infauna and benthic communities within the immediate surrounds of each SPJ location and it is expected to take several years for each area to recover to a state comparable with the nearby surrounding sandy bottom environment.	obstructed. Impacts will be localised and are expected to be proportionately less than for Option C based on the differing extent of dredging required.			
	Impact of seabed	Short—medium	No controls identified.	**Consequence Level IV**	**Consequence Level IV**	**No impact**	**No impact**	**No impact**

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	dredging to environment – water quality (**turbidity**) causing impacts to biota	term (days–-months)		Inconsequential or no adverse effects.	Inconsequential or no adverse effects			
				This Option assumes large scale seabed dredging is required to facilitate the cutting of 176 piles. A total of 88,000 m^3 of material is estimated to require dredging. Dredge spoil will be released to the environment and will result in the generation of localised turbidity at each SPJ. A KEF known as the East of Eden Upwelling is located near the FLA SPJ. Dredging at FLA may result in impacts to this KEF. Turbidity is expected to resolve in a short period of time following the completion of dredging. Larger, mobile fauna such as fish and crabs have the ability to move away from the sediment plume generated by dredging and are likely to be less affected. There would likely be localised turbidity that may impact gill function in impacted individuals. Assumed dredge volumes on an individual SPJ basis are included in Appendix A6.	This Option assumes some dredging will be required in order to provide access to cut locations where internal cutting is obstructed. Impacts will be localised and are expected to be proportionately less than for Option C based on the differing extent of dredging required.	No seabed dredging will take place as part of this Option.	No seabed dredging will take place as part of this Option.	No seabed dredging will take place as part of this Option.
	Impact of seabed dredging to environment – **release of contaminants** causing a reduction in	Short-medium term (days-months)	No controls identified.	**Consequence Level IV** Inconsequential or no adverse effects	**Consequence Level IV** Inconsequential or no adverse effects	**No impact**	**No impact**	**No impact**
				This Option assumes large scale seabed dredging is required to facilitate the cutting of 176 piles. A total of	This Option assumes some dredging will be required in order to provide access to cut locations where internal cutting	No seabed dredging will take place as part of this Option.	No seabed dredging will take place as part of this Option.	No seabed dredging will take place as part of this Option.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	ecosystem health.			88,000 m^3 of material is estimated to require dredging. Estimated dredge volumes on an individual SPJ basis are included in Appendix A6. Dredge spoil will be released to the environment at each SPJ. Sampling and analysis of sediments around the WTA, KFA, CBA, HLA and FLA facilities was undertaken as part of the Environmental Survey 1 (Summer) (Hook S. E., et al., 2022). Sampling from the remaining SPJs was carried out as part of Survey 2 (Winter) and the results will be incorporated into this assessment when available. The analysis of the surface grab samples collected in Environmental Survey 1 (Summer) identified low concentrations of metals and PAHs in the sediments in a limited number of samples from some SPJs. Platform specific results are discussed further in Section 5 and all Environmental Survey 1 (Summer) data is included in Appendix F2. Dredging will disturb sediments which may result in a portion of any contaminants present within the sediment desorbing and becoming biologically available to filter-feeding organisms. Impacts from this contaminant mobilisation may potentially be exacerbated by the mobilisation of suspended sediments to a wider area via currents (Hook S. E., et al.,	is obstructed. Impacts will be less than that expected for Option C.			

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				2022). Impacted filter feeding organisms may also be consumed by higher trophic levels in the food chain resulting in wider distribution or potential bioaccumulation of contaminants. Exposure and remobilisation of any contaminated sediments may impact the quality and/or value of the post removal habitat however, in the long term, conditions will stabilise as the more mobile components dissipate and new sediment cover is deposited over disturbed areas.				
Direct environmental emissions from seabed placement activities.	Disturbance of **sediments as a result of placement of removed SPJ section**(s) on the seabed, leading to smothering and loss of benthic **infauna**.	Medium-long term (months – - years)	Placement will be within the title boundary and as close as practicable to the lower SPJ sections remaining in place.	**N/A** No seabed placement.	**N/A** No seabed placement.	**N/A** No seabed placement.	**Consequence Level IV** Inconsequential or no adverse effects Seabed disturbance from the placement of cut sections of jackets on the seabed will be limited to close proximity to the jacket lower sections. Infauna and communities within the OAs show natural small-scale variation, however, are mostly homogenous. Platform specific estimates of additional seabed coverage are included in Appendix A7.. The extent of impact will be limited to the footprint of any cut section of structure to be placed.	**N/A** No seabed placement.
	Disturbance of **sediments as a result of placement of**	Medium-long term		**N/A** No seabed placement.	**N/A** No seabed placement.	**N/A** No seabed placement.	Consequence Level IV Inconsequential or no adverse effects	**N/A** No seabed placement.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	removed section(s) on the seabed, leading to changes in local water quality as a result of turbidity and release of contaminants.	(months-years)					Turbidity impacts are likely to be short term and temporary – as sediments will settle and water quality will return to pre disturbance levels. Concentrations of metals and PAHs measured in sediment samples collected from surface grab samples around selected SPJs in 2021 concluded that concentrations rarely exceeded the higher screening levels for the analytes sampled, suggesting there is not widespread nor significant contamination of sediments around the SPJs (Hook S. E., et al., 2022). Measured concentrations were greatest in close proximity to the SPJs	
Direct emissions from SPJ removal activities.	Disturbance and modified behaviour of sensitive marine fauna (e.g. blue whales) as a result of exposure to **underwater noise** generated by vessel and cutting activities to execute end states.	Medium-long term (months-years)	To be defined in the Campaign #1 – End State Execution EP/s.	**Consequence Level II** Significant adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects.	**Consequence Level III** Minor adverse effects.
				Sources of marine noise during decommissioning include sound from vessel propulsion systems (e.g. engine and thrusters), vessel from equipment (e.g. pumps, generators, etc.) and underwater equipment including ROV and cutting equipment. Highest noise levels are likely to occur during the use of bow thrusters to maintain position. Eni Australia Ltd (2019) measured underwater noise from a support vessel holding its position using bow-thrusters and strong thrust from its main engines as 182dB (re: 1 µPa) at 1m and 137dB (re: 1µPa) at 405m. Levels of 120dB (re 1µPa)	See commentary on Option C for explanation of sources of marine noise, discussion on Biologically Important Area and the potential impact of loud noises or noise for extended periods of time. This Option D assumes that some dredging may be required on a limited basis where necessary to facilitate the optimum cut location for removal of the SPJs as close as practicable to the seabed. Under this Option, the duration when noise is generated by vessels and cutting activities is less than Option C. The estimated vessel needs are in the order of one month of HLV and two months of CSV days	See commentary on Option C for explanation of sources of marine noise, discussion on Biologically Important Area and the potential impact of loud noises or noise for extended periods of time. This Option E assumes that there is no dredging where cuts are made to achieve a minimum clearance of -55 metres. Under this Option, the duration when noise is generated by vessels and cutting activities is less than Option C. The estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option.	See commentary on Option C for explanation of sources of marine noise, discussion on Biologically Important Area and the potential impact of loud noises or noise for extended periods of time. This Option E plus seabed placement assumes that there is no dredging where cuts are made to achieve a minimum clearance of -55 metres. Adjacent placement may possibly be achieved with a similar cutting effort to Option E depending on the final vessel size and heavy lift capabilities. However, for the purpose of impact and risk assessment, it was assumed that minor additional cutting effort would be required.	See commentary on Option C for explanation of sources of marine noise, discussion on Biologically Important Area and the potential impact of loud noises or noise for extended periods of time. This Option F assumes that there is no dredging where cuts are made to achieve a minimum clearance of -26 metres. Estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option. Impacts of this Option F are proportionately less than that for Option D.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				extended for a distance of approximately 3-5 km from the source. This Option assumes large scale dredging is required to facilitate the cutting of 176 piles. Dredging equipment will also add cumulative noise impacts. The Gippsland Basin is a Biologically Important Area (BIA) for several sound sensitive species. Sensitive species include cetaceans, pinnipeds and marine reptiles. Five whale species are currently listed under the EPBC Act as nationally threatened and known to be present, breed or forage in the Gippsland Basin area: blue whale), Southern right whale(E), sei whale (V), fin whale (V) and humpback whale (V). Three turtle species are currently listed under the EPBC Act as nationally threatened and known to occur in the OAs: leatherback turtle (E), loggerhead turtle (E) and green turtle (V). Blue whales and Southern right whales also are subject to Conservation Management Plans. Loud noises or noise for long periods of time may lead to avoidance of important habitat areas, interruption to communication, disturbance of foraging and, in some situations, physical damage, including permanent or temporary hearing loss. Impacts from decommissioning noise	per SPJ to execute this Option. Estimated impacts of this Option are approximately half that of Option C.	Impacts of this Option are similar to that for Option D and approximately half that of Option C	Under this Option, the duration when noise is generated by vessels and cutting activities is less than Option C. The estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option. Impacts of this Option are consistent with that for Option D and approximately half that of Option C.	

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				sources are expected to be limited to temporary behavioural change and threshold shift in marine fauna (e.g. increase stress levels in marine fauna, disruption to marine fauna underwater acoustic cues and secondary ecological effects – alteration of predator prey relationship). Permanent noise related injury is not anticipated. Any displacement due to noise disturbance is likely to be localised to the area of the decommissioning activities and is not expected to displace or disrupt species from foraging within the broader Gippsland Basin area. Any behavioural impacts resulting from underwater sound emissions will be short term and will not impact the long-term survival of sound sensitive species. The estimated total work effort required for this Option is in the order of two months of Heavy Lift Vessel (HLV) days and five months of CSV days per SPJ. Impacts of this Option are approximately double that for Option D. These estimates exclude any concurrent activities such as topside removals. Consideration of the cumulative impact of concurrent production and removal activities are assessed in Table 3-8.				

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	Disturbance and modified behaviour of marine fauna (including but not limited to turtles) as a result of exposure to **lighting** during vessel and cutting activities to execute end states.	Medium – long term (months - years)	No controls identified.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Lights on vessels will be required on a 24-hour basis for safety and navigational purposes. Light may change the behaviours of light-sensitive species such as seabirds, turtles, squid and zooplankton which in turn may affect predator-prey dynamics and/or alteration of behaviour that may affect species during breeding periods (e.g. turtles). Any behavioural impacts resulting from light emissions are expected to be short term and are not expected to impact the long-term survival and recovery of threatened species. The estimated total work effort required for this Option is in the order of two months of HLV days and five months of CSV days per SPJ. Impacts of this Option are approximately double that for Option D. While lighting will be required for the duration of field execution, existing topside lighting will be permanently removed under all options and will provide an overall benefit for all options.	Estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option.	Estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option. Impacts of this Option are similar to that for Option D.	Adjacent placement may possibly be achieved with a similar cutting effort to Option E depending on the final vessel size and heavy lift capabilities. However, for the purpose of impact and risk assessment, it was assumed that minor additional cutting effort would be required. Estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option. Impacts of this Option are consistent with that for Option D. .	Estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option. Impacts of this Option are proportionately less than that for Option D.
	Release of **non-greenhouse gas air emissions** from	Medium - long term	To be defined in future Campaign #1 – End State	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	vessels during activities to execute end states causing a reduction in local air quality impacting marine fauna (such as seabirds) in the immediate area.	(months - years)	Execution EP/s.	Localised release of non-greenhouse gas emissions (such as nitrogen oxides, sulphur oxides, particulates etc.), can lead to a reduction in local air quality which could impact marine fauna such as seabirds in the immediate vicinity of the discharge. Local impacts are considered mitigated by the dispersive nature of the offshore environment. Any potential local elevated concentrations of air emissions will be short and unlikely to be detectable except in the near vicinity of point of release. Total discharges and differences in emissions between Options are a function of the respective work durations. The estimated total work effort required for this Option is in the order of two months of HLV days and five months of CSV days per SPJ. Impacts of this Option are approximately double that for Option D.	Estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option.	Estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option. Impacts of this Option are similar to that for Option D.	Adjacent placement may possibly be achieved with a similar cutting effort to Option E depending on the final vessel size and heavy lift capabilities. However, for the purpose of impact and risk assessment, it was assumed that minor additional cutting effort would be required. Estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option. Impacts of this Option are consistent with that for Option D.	Estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option. Impacts of this Option are proportionately less than that for Option D.
	Release of **greenhouse gas** air emissions from vessels during activities to execute end states contributing to local greenhouse gas emissions.	Medium - long – term (months - years)	No controls identified.	**Consequence Level III** Minor adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				The levels of air emissions generated from vessels and equipment used in SPJ decommissioning will vary based on the extent of works required. Generally, emissions would be expected to increase with increasing SPJs weight (i.e. the amount of the SPJ to be removed)	Estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option.	Estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option. Impacts of this Option are similar to that for Option D.	Adjacent placement may possibly be achieved with a similar cutting effort to Option E depending on the final vessel size and heavy lift capabilities. However, for the purpose of impact and risk assessment, it was assumed that minor	Estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option. Impacts of this Option are proportionately less than that for Option D.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				and water depths. Structural complexity of the SPJs also influences emissions as this impacts the duration of work, number of crane lifts and equipment needed. Total differences in overall greenhouse gas emissions between options are a function of the respective work durations. The estimated total work effort required for this Option is in the order of two months of HLV days and five months of CSV days per SPJ. Impacts of this Option are approximately double that for Option D.			additional cutting effort would be required. Estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option. Impacts of this Option are consistent with that for Option D.	
	Impacts to local infauna or sessile organisms from **small-scale disturbance of sediments** from anchoring/ mooring during activities to execute end states.	Short term (days)	No controls identified.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				The extent of disturbance of sediments from mooring and anchoring activities is considered to be negligible. Chemical characterisation of samples collected during Environmental Survey 1 (Summer) identified that the majority of samples returned concentrations below screening levels (refer Section 5.3.3.3). The overall level of contamination (metals and occasionally PAHs) is low and the environmental impact of small-scale disturbance is expected to be minimal based on screening values alone.	Due to the very localised and minimal areas of disturbance, impacted communities are expected to recolonise any damaged areas upon completion of activities (Eni Australia Ltd, 2019). Anchoring/mooring may be required under all options.	Impacts of this Option are consistent with those assessed for Option C and D. Anchoring/mooring may be required under all options.	Impacts of this Option are consistent with those assessed for Option C and D. Anchoring/mooring may be required under all options.	Impacts of this Option are similar to that for Option C and D. Anchoring/mooring may be required under all options.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				Deployment of moorings may also result in localised crushing, disturbance or smothering of adjacent organisms. Mooring activities are not expected to result in widespread disturbance of sediments or habitats.				
	Routine vessel discharges during activities to execute end states (brine, deck drainage and bilge, sewage and grey water, cooling water, food waste) leading to changes in water quality, injury or behavioural change in fauna.	Medium - long – term (months - years)	To be defined in Campaign #1– End State Execution EP/s.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Impacts will be localised to the discharge location(s). As discharges will be intermittent and vessels will be moving around the OAs, impacts are expected to be short term with water quality quickly returning to ambient levels. Any impacts will be inconsequential or have no adverse effect, and no impacts to ecological, economic, cultural or social receptors are expected. Impacts are proportionate to overall required vessel durations. The estimated total work effort required for this Option is in the order of two months of HLV days and five months of CSV days per SPJ. Impacts of this Option are approximately double that for Option D.	Estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option.	Estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option. Impacts of this Option are similar to that for Option D.	Adjacent placement may possibly be achieved with a similar cutting effort to Option E depending on the final vessel size and heavy lift capabilities. However, for the purpose of impact and risk assessment, it was assumed that minor additional cutting effort would be required. Estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option. Impacts of this Option are consistent with that for Option D.	Estimated vessel needs are in the order of a month each of HLV and CSV days per SPJ to execute this Option. Impacts of this Option are proportionately less than that for Option D.
Physical presence of vessels during activities to execute end states –	**Exclusion of commercial fisheries** from OA during decommissionin g execution operations	Medium - long term (months - years)	To be defined in future Campaign #1– End State Execution EP/s.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Decommissioning activities will require transit of vessels	Estimated vessel needs are in the order of one month of HLV	Estimated vessel needs are in the order of a month each of	Adjacent placement may possibly be achieved with a	Estimated vessel needs are in the order of a month each of

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
Impacts to commercial fishing.	which extend outside the 500m zone, leading to a reduction in fish catch.			between shore and the OAs. Activities outside the 500m platform exclusion zone may result in temporary disruption of nearby commercial fishing activities around the exclusion zone. Given the extensive operating area utilised by Commonwealth and State fisheries and the low number of vessels likely to be operating in the area, impacts are expected to be inconsequential or no adverse effects. Impacts are proportionate to overall required vessel durations. The estimated total work effort required for this Option is in the order of two months of HLV days and five months of CSV days per SPJ. Impacts of this Option are approximately double that for Option D.	and two months of CSV days per SPJ to execute this Option.	HLV and CSV days per SPJ to execute this Option. Impacts of this Option are similar to that for Option D.	similar cutting effort to Option E depending on the final vessel size and heavy lift capabilities. However, for the purpose of impact and risk assessment, it was assumed that minor additional cutting effort would be required. Estimated vessel needs are in the order of one month of HLV and two months of CSV days per SPJ to execute this Option.	HLV and CSV days per SPJ to execute this Option. Impacts of this Option are proportionately less than that for Option D.
Indirect consequences of end state options (onshore dismantling and disposal of removed sections of SPJs)								
Generation of **discharges and emissions** from onshore processing/ recycling of scrap steel.	Combustion and greenhouse gas emissions contribute to impacts on local ambient air quality and contribute to greenhouse gas emissions.	Medium - long term (months - years)	Onshore dismantling and disposal to comply with applicable permits/ regulatory requirements applicable to the ORC. Dismantling and waste disposal to be managed in accordance	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				SPJ materials brought onshore for dismantling and disposal will be dismantled down to smaller sizes for recycling as scrap metal. Air emissions (nitrogen oxides, sulphur oxides, greenhouse gas etc.) associated with onshore processing and handling of materials are considered	The total steel removal weight to be processed onshore as estimated for Option D is in the order of 30,000MT.	The total steel removal weight to be processed onshore as estimated for Option E is in the order of 25,000MT.	The total steel removal weight to be processed onshore as estimated for this Option is in the order of 17,000MT. This Option avoids the combustion and greenhouse gas emissions that would occur if all removed sections of the SPJs were taken onshore for processing/recycling. However this Option also results in the	The total steel removal weight estimated for Option F is in the order of 16,000MT. This Option will result in the lowest relative air emissions.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
			with environmental management plans.	minimal in comparison with the energy requirements to melt scrap steel (as part of the recycling process). Scrap metal is most commonly reprocessed in electric arc furnaces (Sustainability Victoria, 2022). The total steel removal weight estimated for Option C is in the order of 33,000MT. Carbon dioxide and other combustion emissions will be proportionate to the total mass of steel to be disposed of. On that basis, this Option produces the highest relative emissions. While processing scrap does produce emissions, those emissions are expected to be less than that required to manufacture virgin steel and so a net reduction in overall emissions on a lifecycle basis may be achieved.			retention of steel in place that may alternatively be recycled and reused, thus reducing emissions required to manufacture virgin steel. Any consideration of the additional virgin steel production that would result from lost scrap recovery vs. habitat retention also needs to consider the energy and resources required to reprocess the scrap back into a useable form. On balance, the difference in global emissions based on the quantity of materials that would be retained is considered negligible. World Steel Association data indicates that globally, 1 950.5 million tonnes of crude steel was produced in 2021. (Association, 2022) For comparison, the quantity of steel retained in the environment as habitat under this Option compared with Option C is less than 0.001% of the global steel production volume for 2021.	
	Release of odour onshore from marine growth prior to dismantling of SPJ, leading to nuisance and community complaints.	Medium - long term (months - years)		**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Localised odour may be generated from the onshore processing/removal of marine growth during dismantling of SPJs. Onshore dismantling and processing of wastes will be managed under approved environmental management plans and in accordance with any licences or permits	Impacts of this Option are consistent with those assessed for Option C.	Odour may be expected to be proportionally less than Options C and D based on the lower volume of marine growth bought onshore.	Odour may be expected to be proportionally less than Option E, due to the lower volume of marine growth bought onshore.	Odour may be expected to be proportionally less than Options C and D based on the lower volume of marine growth bought onshore.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				required for the operation of the ORC.				
	Generation of noise during onshore dismantling of removed sections of SPJs, leading to nuisance and community complaints.	Medium - long term (months - years)		**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Localised noise emissions will be generated from the onshore processing of materials. Onshore dismantling impacts will be managed under approved environmental management plans and in accordance with any licences or permits required for the operation of the ORC.	Impacts of this Option are consistent with those assessed for Option C.	Any noise impacts would be expected to be proportionally less than Options C and D based on the proportionally less volume of material bought onshore for dismantling.	Any noise impacts would be expected to be proportionally less than Option E based on the proportionally less volume of material bought onshore for dismantling.	Any noise impacts would be expected to be proportionally less than Options C and D based on the proportionally less volume of material bought onshore for dismantling.
	Generation of additional **traffic** during onshore dismantling and disposal of SPJs, leading to nuisance and community complaints.	Medium - long term (months - years)		**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Additional traffic will be generated from the onshore processing of materials. Recreational fishers asked if decommissioning would require any special road equipment and traffic movements. This is a possibility and will become clearer as planning for the ORC progresses. Scrap	Impacts of this Option are consistent with those assessed for Option C.	Generation of additional traffic would be expected to be proportionally less than Options C and D based on proportionally less volume of material bought onshore for dismantling and disposal.	Generation of additional traffic would be expected to be proportionally less than Option E based on the proportionally less volume of material bought onshore for dismantling and disposal.	Generation of additional traffic would be expected to be proportionally less than Options C and D based on the proportionally less volume of material bought onshore for dismantling and disposal.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				steel is often shipped internationally for processing. Onshore dismantling and disposal impacts will be managed under approved environmental management plans and in accordance with any licences or permits required for the operation of the ORC.				
	Generation of **light emissions** during onshore dismantling of SPJs, leading to nuisance and community complaints.	Medium - long term (months - years)		**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Limited and localised light emissions will be generated from the onshore processing of materials.	Impacts of this Option are consistent with those assessed for Option C.	The duration of the generation of light would be expected to be proportionally less than Options C and D based on proportionally less volume of material bought onshore for dismantling and disposal.	The duration of the generation of light would be expected to be proportionally less than Option E based on the proportionally less volume of material bought onshore for dismantling and disposal.	The duration of the generation of light would be expected to be proportionally less than Options C and D based on proportionally less volume of material bought onshore for dismantling and disposal.
	Generation of **dust emissions** during onshore dismantling of SPJs, leading to nuisance, community complaints and impacts to local air quality.	Medium – long term (months - years)		**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.	**Consequence Level IV** Inconsequential or no adverse effects.
				Dust (PM2.5 and PM10) may be generated by heavy equipment and transport movements on unsealed roads during the onshore processing of scrap steel prior to disposal. Onshore dismantling impacts will be managed under approved environmental management plans and in accordance with any licences or permits required for the operation of the ORC.	Impacts of this Option are consistent with those assessed for Option C.	Dust generation would be expected to be proportionally less than Options C and D based on the proportionally less volume of material bought onshore for dismantling and disposal.	Dust generation would be expected to be proportionally less than Option E based on the proportionally less volume of material bought onshore for dismantling and disposal.	Dust generation would be expected to be proportionally less than Options C and D based on the proportionally less volume of material bought onshore for dismantling and disposal.

WTA and BMA excluded from Option E assessment due to shallow water depths.
WTA, BMA and FTA excluded from Option E plus placement assessment due to shallow water depths.

Table 3-8 Assessment of cumulative impacts of existing platform (production and well) operations with activities to execute end-state options

During the voluntary public comment period for this EP, feedback received from a relevant person stated that the draft EP did not adequately address cumulative impacts associated with the proposed decommissioning. Table 3-8 has been added in response to this feedback. Note that activities to execute the end state option will be the subject of future Campaign #1 – End State Execution EP/s, once the removal contractor and methodology to undertake the execution has been determined.

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
Assessment of cumulative impacts of existing production operations with activities to execute end-state options								
Physical Presence – Interference with Other Marine Users	Change to the function, interests or activities of other users Change to the function, interests or activities of other users could occur through disruption of commercial and recreational activities. Disruption to activities includes: • exclusion of vessels to areas around the activity; • damage to fishing equipment; and • loss of commercial fish catch.	Medium - long term (months - years)	Included in accepted Bass Strait Operations Environment Plan	**No cumulative impact** The impact of the physical presence of SPJs in (i) excluding commercial fisheries; and (ii) absence of impact on shipping (iii) recreational activities from around each structure, (iv) navy vessels, (v) Traditional owners, (vi) unions and (vii) eNGOs is the same regardless of whether the SPJ is performing production operations or execution activities to remove an SPJ.				
Underwater Sound Emissions Normal platform operations generate	Change in ambient noise Change in fauna behaviour	Medium - long term (months - years)	None identified	Cumulative noise impacts and any associated noise controls can only be properly assessed based on (i) planned concurrent activities at the time of decommissioning; and (ii) noise characteristics of removals vessels. This assessment will be done as part of the Campaign #1 – End State Execution EP/s.				

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
sound at 162 dB RMS (Hannay, MacGillivray, Laurinolli, & Racca, 2004).								
Light Emissions Navigational and safety lights used during normal platform operations will result in light emissions. Light emissions will also be generated during flaring, with rates varying between platforms and activities.	Change in ambient light Change in fauna behaviour	Medium - long term (months - years)	None identified	**No cumulative impact** Modelling conducted by ERM (2010) on navigational and safety lighting from a MODU showed that light intensity reduced to 0.1 Lux (equivalent to ambient light at full moon to twilight) within 800 m of the source and to 0.01 Lux (equivalent to ambient light at quarter moon) within 1.2 km. Outside 1.2 km, light from the facility would only be detected during a new moon or if the moon is not visible. During execution activities to achieve the proposed end-states, the navigation and safety lighting required for decommissioning vessels is expected to be similar to the lighting that was in place during oil and gas production from any particular platform.				
Emissions to Air Combustion of gaseous and liquid fuels and fugitive emissions vented will occur during platform operations, leading to	Change in air quality Injury / mortality to fauna	Medium - long term (months - years)	Included in accepted Bass Strait Operations Environment Plan	**No cumulative impact** Atmospheric emissions from platform operations will decrease through cessation of operation of emission sources such as combustion engines, fugitive emissions and process vents. At about the same time, emission sources from decommissioning activities will correspondingly increase. It is not expected that there will be a significant increase in emissions to air during decommissioning. In any case, impacts to air quality from emissions to air will be localised to the source and quickly dissipated in the offshore environment. Any impacts will be inconsequential or have no adverse effect.				

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
emissions to air.								
Planned Discharge – Brine Brine is created by the onboard desalination system, via Reverse Osmosis (RO).Discharges will be continuous.	Change in water quality Planned discharges of brine will lead to a change in water quality through: • Increased salinity • Chemical exposure Injury / mortality to fauna	Medium - long term (months - years)	None identified	**No cumulative impact** The discharge of brine from platforms' reverse osmosis (RO) systems will cease upon decommissioning of each platform's living quarters. During decommissioning removal activities, decommissioning vessels will discharge brine from each vessels' RO system. It is not expected that there will be a significant increase in discharge of brine during decommissioning.				
Planned Discharge - Sewage and Grey water Staffing levels vary between platforms, however normally staffed platforms discharge approximately 60-150 m3 of sewage and grey water per day, depending on staffing levels.	Change in air quality Injury / mortality to fauna Change in aesthetic value	Medium - long term (months - years)	None identified	**No cumulative impact** The discharge of sewage and grey water from platforms will cease upon decommissioning of each platform's living quarters. During decommissioning removal activities, decommissioning vessels will discharge sewage and grey water. It is not expected that there will be a significant increase in discharge of sewage and grey water during decommissioning.				

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
Discharge point remains stationary.								
Planned Discharge – Food waste 1-2kg of food waste will be discharged per person per day. Discharge point remains stationary.	Change in fauna behaviour	Medium - longterm (months - years)	None identified	**No cumulative impact** The discharge of food waste from platforms will cease upon decommissioning of each platform's living quarters. During decommissioning removal activities, decommissioning vessels will discharge food waste. It is not expected that there will be a significant increase in discharge of food waste during decommissioning.				
Planned Discharge - Operational Fluids	Localised change in water quality	Medium - long term (months - years)	Included in accepted Bass Strait Operations Environment Plan	**Cumulative benefit** Cessation of production and the subsequent completion of well P&As and topsides flushing will result in the cessation of planned discharges from the pile systems. There will be no planned discharges from the pile systems during the decommissioning removals activities.				
Planned Discharge – Produced Formation Water	Various impacts described in detail in the accepted Bass Strait EP	Medium - long term (months - years)	Included in accepted Bass Strait Operations Environment Plan	**No cumulative impact** Discharge of produced formation water assessed in the Bass Strait EP concluded that produced formation water discharge was expected to have negligible impacts on sediment.				
Assessment of cumulative impacts of existing platform well (wireline/workover) activities with activities to execute end-state options								
Conductor cutting and pulling - Seabed Disturbance Conductor cutting and pulling can lead to seabed disturbance in the immediate	Change in water quality Change in habitat	Medium - long term (months - years)	None identified	**No cumulative impact** For each platform, wireline/workover activities that are required to plug and abandon wells will necessarily have been completed prior to the activity that removes the platform topsides. Therefore, wireline/workover activities and topsides removal are not concurrent activities.				

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
vicinity of the well.								
Wireline / Workover Activities (general) - Emissions to Air Non-routine flaring and venting will occur during depressurisation prior to wellwork activities. Non-routine flaring will occur during production start-up.	Change in air quality Injury/ mortality to fauna	Medium - long term (months - years)	None identified	**No cumulative impact** For each platform, wireline/workover activities that are required to plug and abandon wells will necessarily have been completed prior to the activity that removes the platform topsides. Therefore, wireline/workover activities and topsides removal are not concurrent activities.				
Wireline /workover Activities (general) Conductor cutting and pulling Conductor Clean-out Sandwash Planned Discharge – Operational Fluids Fluids contained within the well will be discharged during sandwash and clean-	Localised change in water quality, sediment quality, injury/mortality to fauna	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** For each platform, wireline/workover activities that are required to plug and abandon wells will necessarily have been completed prior to the activity that removes the platform topsides. Therefore, wireline/workover activities and topsides removal are not concurrent activities.				

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
out. Residual fluids may be discharged in the final stages of conductor cutting. Residual production fluids as well as chemicals from the production system will be discharged into the drains during wellwork operations.								
Wireline /workover Activities – Cementing Planned Discharge – Cement Cementing during wellwork will result in a discharge of dry and mixed cement. After wellwork activities, dry cement may be discharged from the facility. Impacts are restricted to the	Change in water quality Change in sediment quality	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** For each platform, wireline/workover activities that are required to plug and abandon wells will necessarily have been completed prior to the activity that removes the platform topsides. Therefore, wireline/workover activities and topsides removal are not concurrent activities.				

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
Operational Area.								
Conductor Clean-out Sandwash – Planned Discharge – Solids Clean-out and sandwash will result in solids from inside the well bore being discharged to the seabed.	Change in water quality Change in sediment quality	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** For each platform, wireline/workover activities that are required to plug and abandon wells will necessarily have been completed prior to the decommissioning activity that removes the platform topsides. Therefore, wireline/workover activities and topsides removal are not concurrent activities.				
Assessment of cumulative impacts of existing Pipeline and Subsea Inspection, Maintenance and Repair activities with activities to execute end-state options								
Pipeline and Subsea IMR Physical Presence - Interference with Other Marine Users	Change to the function, interests or activities of other users - Change to the function, interests or activities of other users could occur through disruption of commercial and recreational activities. Disruption to activities includes: • exclusion of vessels to areas	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** The main location of SPJ decommissioning execution activities will be within the 500 m PSZ where other marine users are prohibited, resulting in no cumulative impact to other marine users. Secondary locations for SPJ decommissioning outside the 500 m PSZ will mostly involve transport of materials to and from onshore in accordance with standard maritime separation distances.				

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	around the activity; • damage to fishing equipment; and • loss of commercial fish catch. Impacts are restricted to other marine users which interact with the seabed within the Operational Area. No impacts to shipping are expected.							
Pipeline and Subsea IMR Physical Presence – NORM	Change in habitat – Radioactivity derived from natural sources is normally present in the open ocean, particularly at the seabed. Dissolved radium isotopes could be present in NORM scale, potentially increasing the radioactivity levels in close proximity to the scale. If NORM scale is contained in the flowlines it can emit radiation in the form of	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**<u>No cumulative impact</u>** While NORM can be present on some topside production facilities, these will be removed in all options and taken onshore. There is no known NORM associated with the SPJ structures.				

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	higher energy α and γ rays from radium-226 or low energy β rays from radium228 (APPEA, 2002).							
Pipeline and Subsea IMR Physical Presence – Seabed disturbance Physical disturbance to the seabed can occur during IMR activities such as dredging, cutting and temporary storage.	Change in water quality - Seabed disturbance can lead to increased turbidity, which affects water quality.	Medium - long term (months - years)	None identified	**<u>No cumulative impact</u>** Producing platform operations or well abandonment activities do not physically disturb the seabed and will have ceased before decommissioning removal activities in any event.				
Facility Inspection Maintenance and Repair - Emissions to Air Non-routine or safety flaring or venting will occur during facility IMR. Depressuring or pipelines and subsea facilities directs vapours to the flare	Change in air quality Injury / mortality to birds	Medium - long term (months - years)	None identified	**Cumulative benefit** The volume of atmospheric emissions from venting and non-routine flaring will decrease when production ceases and which then results in a corresponding reduction in inspection, maintenance and repair of production equipment.				

Aspect	Impact	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
Facility Inspection Maintenance and Repair Planned Discharge - Operational Fluids	Various impacts described in detail in the accepted Bass Strait Environment Plan	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** There are no planned discharges of production fluids from SPJ decommissioning removal activities.				
Facility Inspection Maintenance and Repair Planned Discharge – Gas (subsea)	Change in water quality	Medium - long term (months - years)	None identified	**No cumulative impact** There are no planned gas discharges from SPJ decommissioning removal activities.				
Facility Inspection Maintenance and Repair Planned Discharge – Solids	Change in water quality	Medium - long erm (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** The volume of planned discharge of solids to either platform drains or at the seabed from activities such as cleaning, abrasive blasting, hot work, repairs and maintenance will decrease when production ceases, with a corresponding reduction in inspection, maintenance and repair of production equipment.				
Assessment of cumulative impacts of operations support activities with activities to execute end-state options								
Vessel Operations – Helicopter Operations – Physical Presence – Interference with Other Marine Users	Change to the function, interests or activities of other users	Medium - long – term (months - years)	None identified	**No cumulative impact** It is likely that level of helicopter operations during decommissioning removals activities (where such helicopters attend such decommissioning vessels) will be similar to the level of helicopter operations that occurs during platform production operations but which will have ceased before decommissioning removals activities.				
ROV Operations – Seabed Disturbance	Change in water quality	Medium - long term (months - years)	None identified	**No cumulative impact** ROV operations that were undertaken during platform production operations will have ceased before decommissioning removals activities. There is likely to be a similar level of ROV operations associated with decommissioning operations.				
Vessel Operations	Change in ambient noise	Medium - long term	Included in accepted Bass	**No cumulative impact**				

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Helicopter Operations Underwater Sound Emissions	Change in fauna behaviour Injury, harm or interference with marine mammals	(months - years)	Strait Environment Plan	It is likely that level of helicopter operations during decommissioning removals activities (where such helicopters attend such decommissioning vessels) will be similar to the level of helicopter operations that occurs during platform production operations but which will have ceased before decommissioning removals activities.				
Vessel Operations ROV Operations – Light Emissions	Change in ambient light Change in fauna behaviour	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** ROV operations that were undertaken during platform production operations will have ceased before decommissioning removals activities. There is likely to be a similar level of ROV operations associated with decommissioning operations.				
Vessel Operations – Emissions to Air	Change in air quality injury / mortality to fauna	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** The increase in emissions to air from decommissioning removal vessels will be offset by the reduction in platform emissions after the cessation of production.				
Vessel Operations – Planned Discharge – Brine	Change in water quality	Medium - long term (months - years)	None identified	**No cumulative impact** There may be a short term increase in the number of vessels in the Gippsland Basin operation when the decommissioning removals activities are present at the same time as the vessels servicing platforms that are continuing to produce gas. However, given the small impact area (within 4m of the discharge point) and short-term nature of the impact, no impacts to ecological, economic, cultural or social receptors will occur.				
Vessel Operations – Planned Discharge – Cooling Water	Change in water quality	Medium - long term (months - years)	None identified	**No cumulative impact** There may be a short term increase in the number of vessels in the Gippsland Basin when the decommissioning removals activities are present at the same time as the vessels servicing platforms that are continuing to produce gas. However, once a vessel moves away from an area, the high energy marine environment is expected to result in the change in water quality quickly dissipating and ambient water quality will be quickly restored.				
	Injury / mortality to fauna	Medium - long term (months - years)	None identified	**No cumulative impact** Early life stages of fish (embryo, larvae) and other plankton are expected to recover rapidly once the activity ceases. Fish, marine mammals and marine reptiles passing through the area will be able to actively avoid entrainment in any heated plume. Acclimation of test organisms at 15, 20 and 25°C allowed them to tolerate temperature increments of 8-9°C without damage (United Nations Environment Programme, 1984)				
Vessel Operations – Planned discharge – Deck Drainage & Bilge	Change in water quality	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** There may be a short term increase in the number of vessels in the Gippsland Basin when the decommissioning removals activities are present at the same time as the vessels servicing platforms that are continuing to produce gas. However, vessels' bilge water will be treated to 15ppm oil in water prior to discharge and modelling indicates discharges disperse rapidly to below the Predicted No Effect Concentration (PNEC) within 70 m, with no long-term impacts expected (Shell Development (Australia) Pty Ltd, 2010)				

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Vessel Operations – Planned Discharge – Sewage and Grey Water	Change in water quality Injury / mortality to fauna Change in aesthetic value	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** There may be a short term increase in the number of vessels in the Gippsland Basin when the decommissioning removals activities are present at the same time as the vessels servicing platforms that are continuing to produce gas. However, in open water environments such as Bass Strait, discharges are rapidly dispersed, and any nutrient enrichment, chemical exposure or increase in turbidity will be short-term and localised with no accumulation of impacts expected. Cumulative impacts are not expected.				
Vessel Operations – Planned Discharge - Food waste	Change in fauna behaviour	Medium - long term (months - years)	Included in accepted Bass Strait Environment Plan	**No cumulative impact** There may be a short term increase in the number of vessels in the Gippsland Basin when the decommissioning removals activities are present at the same time as the vessels servicing platforms that are continuing to produce gas. However, Impacts to fish and birds from the planned discharge of food waste are expected to be highly localised (due to the high energy marine environment, intermittent discharge and rapid consumption) and temporary (behavioural changes will cease once water quality returns to background levels).				

Table 3-9 Risk evaluation – Feasible end state options

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
Evaluation of environmental risks – impacts to other users of the sea								
Interactions with other users of the sea.	**Vessel collision** with SPJ left in place, resulting in vessel damage and loss of cargo (environmental and socioeconomic impacts).	Long term (years)	Remaining SPJs will be marked on navigational charts.	**Risk not credible** Entire SPJ will be removed above seabed.	**Risk not credible** This Option provides adequate navigational clearance even under extreme weather events and for the largest vessels expected in Bass Strait (AMC Search, 2022a).	**Risk not credible** This Option provides adequate navigational clearance even under extreme weather events and for the largest vessels expected in Bass Strait (AMC Search, 2022b).	**Risk not credible** This depth provides adequate navigational clearance even under extreme weather events and for the largest vessels expected in Bass Strait (AMC Search, 2022b).	**Low (4 - EII)** Currently large commercial vessels do not sail in proximity to the SPJs as they are required to adhere to the ATBA and TSS. This assessment assumes the ATBA and TSS will be removed at some time in the future, allowing vessels to traverse over or in proximity to the former SPJ locations. The event scenario envisages: • a large vessel • directly over a remaining structure providing a 26m clearance and • during the right wave conditions. Assessments performed by AMC Search demonstrated that the right wave conditions that could lead to an effective clearance of 26m or greater would be experienced at a frequency of 0.001 in Bass Strait. The likelihood that a large vessel (such vessels are estimated to undertake ~180 transits/year in Bass Strait) would be transiting directly over an SPJ

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
								remaining in place with a clearance of 26m below MSL (small area relative to the size of Bass Strait) at the exact time that these right wave conditions are experienced, is considered to be highly unlikely.
	Commercial fishing gear interaction with SPJ left in place, resulting in equipment damage and/or loss of catch.	Long term (years).	Remaining SPJ will be marked on navigational charts. The current Fishman's Tribunal for compensation for equipment damaged by Esso facilities, will remain in place whilst Esso continues to operate in Bass Strait. Esso will continue to investigate frameworks used to compensate commercial fishers in other jurisdictions (such as the UK Fisheries Trust Fund) and whether such frameworks might be suited to Bass Strait.	**Risk not credible** This Option will remove the SPJs to below the seabed. It is assumed that potential future commercial fishing operations will not need to be displaced from the SPJ locations once natural processes have sufficiently replenished any dredged areas. There will be no risk to commercial fishing gear once natural cover is established. Based on our past experience with trenching and umbilical works within Gippsland Basin, natural replenishment of dredging depressions is expected to occur within a decade of the works occurring.	**Medium (3 - DII)** Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised that no SPJ above the seabed may remain under this Option, the maximum retention of up to 5m of SPJ above the seabed has been assumed for the purpose of assessing impacts to commercial fishing vessels. Any remaining structures are not over trawlable and hence remain a trawl risk. The probability of this event assumes some degree of navigational error or loss of vessel control.	**Medium(3 - DII)** The assessed risk of this Option is consistent with that assessed for Option D as remaining structures will not be over trawlable.	**Medium (3 - DII)** The assessed risk of this Option is consistent with that assessed for Option D as remaining structures will not be over trawlable.	**Medium (3 - DII)** The assessed risk of this Option is consistent with that assessed for Option D as remaining structures will not be over trawlable.
	Fishing gear interaction with SPJ left in place, resulting in **vessel capsize** (loss of vessel and hence inability to fish).	Long term (years)	Remaining SPJ will be marked on navigational charts.	**Risk not credible** This Option will remove the SPJs to below the seabed. It is assumed that potential future commercial fishing operations will not need to be	**Low (4 - EII)** Under this Option, cutting as close as practicable to the seabed may result in cuts being either above or below seabed. While it is recognised	**Low (4 - EII)** The assessed risk associated with this Option is the same as that for Option D	**Low (4 - EII)** The assessed risk associated with this Option is the same as that for Option D	**Low (4 - EII)** The assessed risk associated with this Option is the same as that for Option D as

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				displaced from the SPJ locations once natural processes have sufficiently replenished any dredge areas. There will be no risk to commercial fishing gear once natural cover is established. Based on our past experience with trenching and umbilical works within Gippsland Basin, natural replenishment of dredging depressions is expected to occur within a decade of the works occurring.	that no SPJ above the seabed may remain under this Option, the maximum retention of up to 5m of SPJ above the seabed has been assumed for the purpose of assessing impacts to commercial fishing vessels. There are no known instances of such a scenario in Bass Strait. The only known instance with any similarity is the capsize and sinking of the Westhaven AH190 in the North Sea in 1997 (Marine Accident Investigation Branch, 1998). The Westhaven was a 19m wooden fishing vessel that sunk with four crew onboard when a trawl door became snagged on a pipeline. The incident investigation concluded that the capsize occurred due to the combination of excessive winch pre-tension, swell, and propeller thrust that pulled the vessel over. Probability of a similar event occurring in the Gippsland Basin is considered unlikely given the general operating precautions and practices of the local fishing fleet.	as remaining structures will not be over trawlable.	as remaining structures will not be over trawlable.	remaining structures will not be over trawlable.
Evaluation of environmental risks – marine flora and fauna								
				Risk not credible.	**Low (4 - DIV)**	**Low (4 - DIV)**	**Low (4 - DIV)**	**Low (4 - DIV)**

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
Impacts to the Gippsland Basin from previously absent introduced invasive marine species (IMS).	SPJs remaining in place provides a potentially suitable habitat for initial colonisation by an introduced **invasive marine species.**	Long term (years)	No controls identified.	SPJ removed to below the seabed. Once natural processes have sufficiently replenished any dredge areas, there will be no remaining hard substrate habitat.	There are two known introduced IMS in the Gippsland Basin, the Northern Pacific seastar (*Asterias amurensis*) and New Zealand screw shell (*Moaricolpus roseus*) (Esso, 2020). For this event to occur a vessel would need to discharge ballast etc. directly over the infrastructure and the introduced IMS would need to survive to colonise. The chance of this event occurring has been assessed as very unlikely. No introduced IMS have been identified in any of the ROV footage of the SPJs or infauna samples reviewed to date through the Environmental Survey 1 (Summer)..	The assessed risk of this Option is consistent with that assessed for Option D.	The assessed risk of this Option is consistent with that assessed for Option D. While there would be more incremental structure on the seabed for potential introduced IMS colonisation under this Option, this is not assessed as significant enough to change the assessed probability and consequence of this scenario.	The assessed risk of this Option is consistent with that assessed for Option D.
	SPJs remaining in place act as **vectors for the spread of introduced IMS** (between multiple SPJs and/or natural areas).	Long term (years)	No controls identified.	**Risk not credible**	**Low (4 - DIV)**	**Low (4 - DIV)**	**Low (4 - DIV)**	**Low (4 - DIV)**
				SPJ removed to below the seabed. Once natural processes have sufficiently replenished any dredge areas, there will be no remaining hard substrate habitat.	SPJ's left in place have the potential to act as vectors to the spread of IMS - by acting as 'stepping stones' which provide hard substrate across a soft seabed habitat. There is no indication that platforms are currently acting as vectors for introduced IMS based on field survey results to date or in the review of historical ROV footage.	The assessed risk of this Option is consistent with that assessed for Option D.	The assessed risk of this Option is consistent with that assessed for Option D. While there will be more incremental structure on the seabed under this Option, this is not assessed as significant enough to change the assessed probability and consequence of this scenario.	The assessed risk of this Option is consistent with that assessed for Option D.
				Risk not credible	**Low (4 - DIV)**	**Low (4 - DIV)**	**Low (4 - DIV)**	**Low (4 - DIV)**

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	SPJs remaining in place act as **vectors for the spread of climate change induced range expansion of invasive native species** (between multiple SPJs and/or natural areas).	Long term (years)	No controls identified.	SPJ removed to below the seabed. Once natural processes have sufficiently replenished any dredge areas, there will be no remaining hard substrate habitat.	SPJ's left in place have the potential to act as vectors to the spread of climate change induced range expansion of invasive native species- by acting as 'stepping stones' which provide hard substrate across a soft seabed habitat. There were occasional observations of a small number of the long spined sea urchin on some platforms (AIMS, 2022a). The long spined sea urchin was first observed as far south as Tasmania in the late 1970's and as such it's presence in the region is not unexpected. No other range expanding invasive native species were observed. The lack of abundant macroalgae, dense surface coverage by potentially bio-limiting jewel anemones and presence of predators including mature lobsters and Port Jackson sharks at some facilities may have contributed to the SPJs being unsuitable habitat for sustaining large sea urchin populations. The influence of remaining SPJ footings in terms of connectivity for the long spined sea urchin specifically is being assessed.	The assessed risk of this Option is consistent with that assessed for Option D.	The assessed risk of this Option is consistent with that assessed for Option D. While there will be more structure on the seabed under this Option, this is assessed as not significant enough to change the assessed probability and consequence of this scenario given the likelihood that the placed sections will become a continuation of the existing, habitat which appears to be unsuitable for sustaining large populations of the long spined sea urchin .	The assessed risk of this Option is consistent with that assessed for Option D.

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
Evaluation of environmental risks – execution activities to achieve end states								
Impacts to marine biota through incidents during the execution of the decommissioning works	Risk to marine life from **small dropped objects** (floating waste) from vessel operations.	Short term (days).	Operational controls.	**Low (4 - CIV)** Potential impacts associated with small dropped objects include potential physical harm to marine fauna resulting from ingestion or entanglement with solid floating waste (such as plastic bags). Potential impacts are likely to be limited to one or a few individual marine animals, with the most likely fauna affected being those swimming or feeding within the surface waters. This assessment considers that industry standard operating practices require vessel crews to make all reasonable endeavours to secure wastes and materials to prevent potential losses. Potential losses are considered very infrequent and small volume. The estimated total work effort required for this Option is in the order of two months of HLV days and five months of CSV days per SPJ. Total works duration is a factor in assessing the likelihood of dropped object events occurring.	**Low (4 - DIV)** This Option requires approximately half the vessel operating time as Option C. Total works duration is a factor in the likelihood of occurrence.	**Low (4 - DIV)** The assessed risk of this Option is consistent with that assessed for Option D.	**Low (4 - DIV)** The assessed risk of this Option is consistent with that assessed for Option D.	**Low (4 - DIV)** The assessed risk of this Option is consistent with that assessed for Option D.

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
	Risk to marine life from **large dropped objects** (i.e. large segment of structure) from vessel operations.	Medium Term (months).	Operational controls.	**Low (4 - EIV)**	**Low (4 - EIV)**	**Low (4 - EIV)**	**Low (4 - EIV)**	**Low (4 - EVI)**
				Dropped objects (large structure segments) may result in mortality of sessile and slow-moving biota through direct contact with benthic communities growing on the remaining SPJ or disturbance of the adjacent seabed. Large dropped objects will need to be recovered. Disturbed areas will regenerate over time. Loss of a large segment of structure is considered very unlikely and will be addressed in the execution planning.	The assessed risk of this Option is consistent with that assessed for Option C.	The assessed risk of this Option is consistent with that assessed for Option C.	The assessed risk of this Option is consistent with that assessed for Option C.	This Option removes the least amount of material from the facilities. The assessed risk of this Option is consistent with that assessed for Option C.
	Risk to marine life from unplanned loss of small quantities (<800L) of hydrocarbons (diesel) from work vessels.	Short term (days)	Procedures and operational controls.	**Low (4 – BIV)**	**Low (4 – BIV)**	**Low (4 – BIV)**	**Low (4 – BIV)**	**Low (4 – BIV)**
				Spills may occur due to equipment failure or incorrect storage and handling of materials. Potential spill volumes are considered small and will most likely be associated with any on-deck generators or temporary equipment. Early life stages of fish (embryos, larvae) and other plankton would be most susceptible to the toxic exposure from an unplanned release of hydrocarbons, as they are less mobile and therefore can become	This Option requires approximately half the vessel operating time as Option C. Total works duration is a factor in the likelihood of occurrence.	The assessed risk of this Option is consistent with that assessed for Option D.	The assessed risk of this Option is consistent with that assessed for Option D.	The assessed risk of this Option is consistent with that assessed for Option D.

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				exposed to the plume. Phytoplankton are typically not sensitive to the impacts of oil, though they do accumulate it rapidly, whilst zooplankton are known to be vulnerable to hydrocarbons (Hook, Batley, Holloway, Irving, & Ross, 2016). Due to the high energy marine environment, impacts will be limited to the discharge location and will be quickly dissipated. Any impacts will be inconsequential or have no adverse effects. The estimated total work effort required for this Option is in the order of two months of HLV days and five months of CSV days per SPJ. Total works duration is a factor in assessing the likelihood of spill events occurring.				
	Risk to marine life from **unplanned loss of small quantities of chemical residues** from storage tanks during removal of upper sections of the SPJ.	Short term (days)	Procedures and operational controls	**Low (4 - DIV)**	**Low (4 - DIV)**	**Low (4 - EII)**	**Low (4 - EII)**	**Low (4 - DIV)**
				All storage tanks within the SPJs will be drained and flushed prior to works commencing. Due to the high energy marine environment, impacts will be limited to the discharge location and will be quickly dissipated. Any impacts will be	The assessed risk of this Option is consistent with that assessed for Option C, as storage tanks will be removed under all options.	The assessed risk of this Option is consistent with that assessed for Option C, as storage tanks will be removed under all options.	The assessed risk of this Option is consistent with that assessed for Option C, as storage tanks will be removed under all options.	The assessed risk of this Option is consistent with that assessed for Option C, as storage tanks will be removed under all options.

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				inconsequential or have no adverse effects.				
	Risk of **injury or mortality of protected EPBC Act-listed marine life** (e.g. Southern right whale) from impact with decommissioning vessel (collision).	Short term (days)	Controls will be considered in the development of the Campaign #1– End State Execution EP/s.	**Low (4 - DIII)**	**Low (4 - DIII)**	**Low (4 - DIII)**	**Low (4 - DIII)**	**Low (4 - DIII)**
				Vessel collision with marine fauna may result in injury or death of marine fauna. Marine fauna that are present in surface waters such as cetaceans are most susceptible to vessel collisions due to their proximity to the vessel (hull, propeller or equipment). Cetaceans including humpback whales demonstrate a variety of behaviours in response to approaching vessels (attributed to vessel noise), including longer dive times and moving away from the vessel's path with increased speed (Eni Australia Ltd, 2019). These behaviours may contribute to reducing the likelihood of a vessel collision. Other marine fauna species including seabirds and fish species are likely to avoid any moving vessels and are considered at low	This Option requires roughly half the vessel operating time as Option C. Total works duration is a factor in the likelihood of occurrence.	The assessed risk of this Option is consistent with that assessed for Option D.	The assessed risk of this Option is consistent with that assessed for Option D.	The assessed risk of this Option is consistent with that assessed for Option D.

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				risk of potential vessel collision. Given that marine fauna exhibit avoidance behaviour, the likelihood of vessel collision with marine fauna is low. This assessment assumes that during movements into or out of the OAs, vessels will move slowly to reduce the risk of collision and allow time for marine fauna to move out of the immediate area. The use of marine mammal observers to reduce the risk of collision is also assumed. The estimated total work effort required for this Option is in the order of two months of HLV days and five months of CSV days per SPJ. Total works duration is a factor in assessing the likelihood occurrence.				
Evaluation of Environmental Risks – Indirect Risks associated with onshore dismantling/disposal of removed sections of SPJs.								
Onshore dismantling and disposal of removed sections of SPJ.	Risk of **soil or groundwater contamination** resulting from repeated loss of small volumes of hydrocarbons during the dismantling and disposal operations.	Medium to long term (months - years)	Onshore dismantling and disposal to comply with applicable permits/regulatory requirements applicable to the ORC.	**Low (4 - DIV)** Small volumes of hydrocarbons may be released to unsealed surfaces during the onshore processing of waste materials including losses of fuel or hydraulic fluids from the heavy equipment needed to dismantle the SPJ.	**Low (4 - DIV)** The assessed risk of this Option is consistent with that assessed for Option C.	**Low (4 - DIV)** The assessed risk of this Option is consistent with that assessed for Option C.	**Low (4 - DIV)** The assessed risk of this Option is consistent with that assessed for Option C.	**Low (4 - DIV)** The assessed risk of this Option is consistent with that assessed for Option C.

Aspect	Risk scenario	Time-frame	Control measures	BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: Lower section of SPJ (including strut footings at HLA, KFA and KFB) left in place, with cut line as close as practicable to the seabed (without large scale dredging)	Option E: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m WTA and BMA excluded	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL WTA, BMA and FTA excluded	Option F: Lower section of SPJ left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m
				Best efforts will be made to utilise site waste and wastewater handling infrastructure and minimise the potential for soil or groundwater contamination. Potential spill volumes are likely to be small and contamination limited by spill response and clean up practices.				

WTA and BMA excluded from Option E assessment due to shallow water depths.
WTA, BMA and Fortescue excluded from Option E plus placement assessment due to shallow water depths.

3.4 Equal or Better Outcome Assessment

An EOBO Assessment was undertaken to determine whether any of the feasible end state options which would not result in complete removal will result in an equal or better environmental outcome when compared to the 'base case' of complete removal.

As stated in Section 1.1, Option C (SPJ foundation piles left in place, with cut line below the seabed) was defined as the 'base case' for comparison purposes. Option B (complete removal of the SPJs including deep foundation piles, some which extend up to 156 metres below the seabed) is not feasible (refer to Section 3.2.4.1).

The EOBO was a qualitative comparison of the identified environmental and socioeconomic benefits as well as assessed impacts and risks of the feasible decommissioning options, as compared to the 'base case' (Option C). The results of the assessment are provided in Table 3-10.

For the purpose of this assessment, an 'equal or better outcome' was achieved where an equal or greater number of impacts and risks for an option were assessed as **Consequence Level IV** (inconsequential or no adverse impacts), **Lower**, **No impact – benefit, No impact** or **No risk** than for the 'base case' option. A summary of the assessment is included at the end of Table 3-10.

The EOBO Assessment concluded that the following feasible end state options will result in an EOBO than the 'base case' which is defined as Option C - SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required):

- Option D – SPJ lower section (and strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed).
- Option E – SPJ lower section (and strut footings where present) left in place, with cut line to achieve a minimum 55 metre clearance below MSL.
- Option E plus placement – SPJ lower section (and strut footings where present) left in place, with cut line to achieve a minimum 55 metres clearance. Selected SPJ sections placed adjacent to the lower sections left in place.
- Option F – SPJ lower section (and strut footings where present) left in place, with cut line to achieve a minimum 26 metre clearance below MSL.

Table 3-10 Equal or Better Outcome Assessment

Impact/risk scenario	Time-frame	Assessed impact/risk level				
		BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	**Option D:** SPJ Lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed)	**Option E:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 55m	**Option E plus seabed placement:** Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL	**Option F:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 26m
Other users of the sea						
Environmental impacts						
Physical presence of SPJ remaining in place requires commercial vessels to continue to be diverted from direct transit over SPJs, resulting in incremental transit time.	Long term (years)	**No impact**	**No impact**	**No impact**	**No impact**	**Consequence Level IV**
Physical presence of SPJs remaining in place requires ongoing exclusion of commercial fishing from the immediate vicinity of the SPJs.	Long term (years)	**No impact**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Physical presence of SPJs remaining in place results in interference to recreational fishing activities in the area.	Long term (years)	**Consequence Level III**	**Consequence Level III**	**No impact - benefit**	**No impact - benefit**	**No impact - benefit**
Physical presence of SPJs remaining in place results in the exclusion of other industries (i.e. wind power) from the immediate locations of the SPJs.	Long term (years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Reduction in SPJ structure leads to a reduction in fish habitat, leading to a reduction in commercial fishing catch (through a loss of productivity/connectivity).	Long term (years)	**Consequence Level III**	**Consequence Level III**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Physical presence of SPJ's remaining in place requires Naval vessels (including submarines) to continue to be diverted from direct transit over or around SPJs	Long term (years)	**No impact**	**No impact**	**No impact**	**No impact**	**No impact**
Physical presence of SPJ's remains in an area of ongoing interest to Traditional Owners	Long term (years)	**No impact**	**No impact**	**No impact**	**No impact**	**No impact**
Physical presence of SPJ's remains in an area of ongoing interest to Unions	Long term (years)	**No impact - benefit**	**No impact - benefit**	**No impact - benefit**	**No impact - benefit**	**No impact - benefit**
Physical presence of SPJ's remains in an area of ongoing interest to Environmental Non-Governmental Organisations (eNGOs)	Long term (years)	**No impact**	**No impact**	**No impact**	**No impact**	**No impact**
Environmental risks						
Vessel collision with SPJ left in place, resulting in vessel damage and loss of cargo (environment and socioeconomic impacts).	Long term (years)	**Risk not credible**	**Risk not credible**	**Risk not credible**	**Risk not credible**	**Lower**

Impact/risk scenario	Time-frame	Assessed impact/risk level				
		BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	Option D: SPJ Lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed)	Option E: SPJ Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 55m	Option E plus seabed placement: Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL	Option F: SPJ Lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 26m
Commercial fishing gear interaction with SPJ left in place, resulting in equipment damage and/or loss of catch.	Long term (years)	**Risk not credible**	**Medium**	**Medium**	**Medium**	**Medium**
Fishing gear interaction with SPJ left in place, resulting in vessel capsize (loss of vessel and hence inability to fish).	Long term (years)	**Risk not credible**	**Lower**	**Lower**	**Lower**	**Lower**
Discharges to the Sea						
Environmental impacts						
Degradation of remaining SPJ structural steel, leading to steel constituent dissolution into immediate waters and exposure to marine biota encrusted to SPJ or using the SPJ as habitat.	Long term (years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Degradation of sacrificial anodes present on SPJs, leading to anode constituent dissolution into immediate waters and impacts to marine biota encrusted to SPJ or using the SPJ as habitat.	Long term (years)	**No impact**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Degradation of cement grout, leading to dissolution of components into immediate waters and exposure to marine biota encrusted to SPJ or using the SPJ as habitat.	Long term (years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Degradation of remaining SPJs, leading to gradual disintegration and collapse of the SPJ and associated periodic smothering impacts to local infauna.	Long term (years)	**No impact**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Environmental risks						
No unplanned discharges to the sea are associated with the proposed end state options being assessed, noting that risks associated with decommissioning activities to <u>execute</u> these end state options will be assessed in the future Campaign #1– End State Execution EP/s.						
Marine flora and fauna						
Environmental impacts						
Local loss of abundance and diversity of sessile (fixed to SPJ) organisms through reduction in SPJ height.	Long term (years)	**Consequence Level II**	**Consequence Level II**	**Consequence Level III**	**Consequence Level III**	**Consequence Level IV**
Local loss of abundance and diversity of fish and other mobile organisms through reduction in habitat provided by SPJs.	Long term (years)	**Consequence Level II**	**Consequence Level II**	**Consequence Level III**	**Consequence Level III**	**Consequence Level IV**

Impact/risk scenario	Time-frame	Assessed impact/risk level				
		BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	**Option D:** SPJ Lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed)	**Option E:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 55m	**Option E plus seabed placement:** Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL	**Option F:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 26m
Local loss of abundance and diversity of not yet identified sponge species observed in water depths greater than ~60m.	Long term (years)	**Consequence Level II**	**Consequence Level II**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Reduction in height of SPJs leading to behavioural changes in identified endangered species (white shark) as a result of changes to current food sources.	Long term (years)	**Consequence Level III**	**Consequence Level III**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Reduction in height of SPJs leading to changes to food source location and abundance for Australian fur seals (protected), resulting in changes in behaviour and distribution.	Long term (years)	**Consequence Level II**	**Consequence Level II**	**Consequence Level III**	**Consequence Level III**	**Consequence Level III**
Reduction in height of SPJs leads to changes in food source location and abundance resulting in changes to the distribution of open water pelagic species (including EPBC Act-listed species – whales etc.).	Long term (years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Reduction in height of SPJs leading to a cumulative reduction in Gippsland Basin ecosystem richness and diversity as a result of a loss of productivity/connectivity (*based on literature).	Long term (years)	**Consequence Level II**	**Consequence Level II**	**Consequence Level III**	**Consequence Level III**	**Consequence Level IV**
Relocation of removed section(s) of SPJs to deeper depths, resulting in local loss of abundance and diversity of biota due to change of habitat.	Long term (years)	**N/A – no seabed placement**	**N/A – no seabed placement**	**N/A – no seabed placement**	**Consequence Level III**	**N/A – no seabed placement**
Relocation of upper section(s) of SPJs to deeper depths, resulting in an increase in hard seabed habitat for sessile and mobile marine biota.	Long term (years)	**N/A – no seabed placement**	**N/A – no seabed placement**	**N/A – no seabed placement**	**N/A - Benefit**	**N/A – no seabed placement**
Environmental risks						
SPJs remaining in place provides a potentially suitable habitat for initial colonisation by an introduced IMS.	Long term (years)	**Risk not credible**	**Lower**	**Lower**	**Lower**	**Lower**
SPJs remaining in place act as vectors for the spread of introduced IMS (between multiple SPJs and/or natural areas).	Long term (years)	**Risk not credible**	**Lower**	**Lower**	**Lower**	**Lower**
SPJs remaining in place act as vectors for the spread of climate change induced range expansion of invasive native species.	Long term (years)	**Risk not credible**	**Lower**	**Lower**	**Lower**	**Lower**
Impact of activities to execute end state options						
Environmental impacts						

Impact/risk scenario	Time-frame	Assessed impact/risk level				
		BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	**Option D:** SPJ Lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed)	**Option E:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 55m	**Option E plus seabed placement:** Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL	**Option F:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 26m
Impact of dredging on local environment – smothering of local infauna and benthic surrounds as part of the initial excavation and cut of piles causing biota mortality.	Long term (years)	**Consequence Level II**	**Consequence Level IV**	**N/A – no dredging**	**N/A– no dredging**	**N/A– no dredging**
Impact of dredging on local environment – water quality (turbidity) causing impacts to biota.	Short - medium term (days - months)	**Consequence Level IV**	**Consequence Level IV**	**N/A– no dredging**	**N/A– no dredging**	**N/A– no dredging**
Impact of dredging on local environment – release of contaminants causing a reduction in ecosystem health.	Short - medium term (days - months)	**Consequence Level IV**	**Consequence Level IV**	**N/A– no dredging**	**N/A– no dredging**	**N/A– no dredging**
Disturbance of sediments as a result of placement of removed SPJ section(s) on the seabed, leading to smothering and loss of benthic infauna.	Short - medium term (days - months)	**N/A– no seabed placement**	**N/A– no seabed placement**	**N/A– no seabed placement**	**Consequence Level IV**	**N/A– no seabed placement**
Disturbance of sediments as a result of placement of removed section(s) on the seabed, leading to changes in local water quality as a result of turbidity and release of contaminants.	Short - medium term (days - months)	**N/A– no seabed placement**	**N/A– no seabed placement**	**N/A– no seabed placement**	**Consequence Level IV**	**N/A– no seabed placement**
Disturbance and modified behaviour of sensitive marine fauna as a result of exposure to underwater noise generated by vessels and cutting activities.	Medium - long term (months - years)	**Consequence Level II**	**Consequence Level III**	**Consequence Level III**	**Consequence Level III**	**Consequence Level III**
Disturbance and modified behaviour of marine fauna (such as turtles) as a result of exposure to light from the use of vessels.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Release of combustion emissions to atmosphere from the use of vessels causing a reduction in local air quality and impacts to marine fauna (such as seabirds) in the immediate area.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Release of greenhouse gases to atmosphere from the use of vessels, contributing to local greenhouse gas emissions.	Medium - long term (months - years)	**Consequence Level III**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**

Impact/risk scenario	Time-frame	Assessed impact/risk level				
		BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	**Option D:** SPJ Lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed)	**Option E:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 55m	**Option E plus seabed placement:** Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL	**Option F:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 26m
Impacts to local infauna or sessile organisms from small scale disturbance of sediments from anchoring/mooring during execution of works.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Routine vessel discharges during activities to execute end state (brine, deck drainage and bilge, sewage and grey water, cooling water, food waste) leading to changes in water quality, injury or behavioural change in fauna.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Exclusion of commercial fisheries from OA during decommissioning execution operations which extend outside the 500m zone, leading to a reduction in fish catch.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Environmental risks						
Mortality or injury of marine fauna as a result of impact with a vessel undertaking removal activities.	Medium - long term (months - years)	**Lower**	**Lower**	**Lower**	**Lower**	**Lower**
Small dropped objects from vessel operations, resulting in impacts to benthic habitats.	Medium - long term (months - years)	**Lower**	**Lower**	**Lower**	**Lower**	**Lower**
Large dropped objects during cutting and lifting operations, resulting in seabed disturbance and impacts to benthic habitats.	Medium - long term (months - years)	**Lower**	**Lower**	**Lower**	**Lower**	**Lower**
Risk to marine biota from unplanned loss of small quantities (<800L) of hydrocarbons (diesel) from vessels.	Medium - long term (months - years)	**Lower**	**Lower**	**Lower**	**Lower**	**Lower**
Risk to marine biota from unplanned loss of small quantities of chemical residues from storage tanks during removal of upper portions of the SPJs.	Short term (days)	**Lower**	**Lower**	**Lower**	**Lower**	**Lower**

Impact/risk scenario	Time-frame	Assessed impact/risk level				
		BASE CASE Option C: SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)	**Option D:** SPJ Lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed)	**Option E:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 55m	**Option E plus seabed placement:** Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL	**Option F:** SPJ Lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 26m
Risk of injury or mortality of protected EPBC Act-listed marine life (e.g. Southern right whale) from impact with decommissioning vessel (collision)	Medium - long term (months - years)	**Lower**	**Lower**	**Lower**	**Lower**	**Lower**
Indirect consequences of decommissioning options (onshore dismantling and disposal of removed sections of SPJs)						
Generation of combustion emissions (including greenhouse gas emissions) to air from onshore processing and recycling of scrap steel contributing to impacts on local air quality and contributing to global greenhouse gas emissions.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Release of odour during removal of marine growth onshore prior to dismantling of SPJs, leading to nuisance and community complaints.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Generation of noise during onshore dismantling of removed sections of SPJs, leading to nuisance and community complaints.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Generation of dust emissions during onshore dismantling of SPJs, leading to nuisance, community complaints and impacts to local air quality.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Generation of additional light during onshore dismantling and disposal of SPJs, leading to nuisance and community complaints.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Generation of additional traffic during onshore dismantling and disposal of SPJs, leading to nuisance and community complaints.	Medium - long term (months - years)	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**	**Consequence Level IV**
Environmental risks						
Risk of soil or groundwater contamination resulting from repeated loss of small volumes of hydrocarbons during the dismantling/disposal operations.	Medium – long term (months to years)	**Lower**	**Lower**	**Lower**	**Lower**	**Lower**

Impact/risk scenario	Time-frame	Assessed impact/risk level				
		BASE CASE Option C: **SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)**	**Option D:** **SPJ Lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed)**	**Option E:** **SPJ Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 55m**	**Option E plus seabed placement:** **Option E plus placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL**	**Option F:** **SPJ Lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 26m**
Total impacts and risks assessed as 'Lower': 'Lower' is defined as **Consequence Level IV** (inconsequential or no adverse impacts), 'Lower', 'No impact', No impact – Benefit, No risk or 'Risk not credible'.		**42**	**43**	**47**	**45**	**50**
Total impacts and risks assessed as 'Higher': 'Higher' is defined as **Consequence Level III** (minor adverse impacts), or **Consequence Level II** (significant adverse impacts) or 'Medium'.		**11**	**10**	**6**	**7**	**3**
Does option result in an equal or better environmental outcome as compared to the 'base case'? 'Yes' = a higher number of impacts and risks assessed as 'Lower' and a lower number of impacts and risks assessed as 'Higher' when compared to the 'base case' Option.		**BASE CASE**	**Yes**	**Yes**	**Yes**	**Yes**

WTA and BMA excluded from Option E assessment due to shallow water depths.
WTA, BMA and Fortescue excluded from Option E plus placement assessment due to shallow water depths.

Legend

Environmental impacts	Environmental risks
No impact	**No risk**
Consequence Level IV Inconsequential or No Adverse Impacts	**Category 4** Lower
Consequence Level III Potential Short term, Minor adverse Effects	**Category 3** Medium
Consequence Level II Potential localised, Medium Term, Significant Adverse Effects	**Category 2** Medium
Consequence Level I Potential Widespread, Long Term, Significant Adverse Effects	**Category 1** Higher

Refer to Sections 7.6 and 7.7 for more detail on impact and risk classification matrix and process.

3.5 Acceptability and As Low As Reasonably Practicable assessment

An assessment was undertaken for the feasible end-state options to determine if the impacts and risks identified for the option could be reduced to levels that were acceptable and ALARP. These are the key acceptance criteria for EP acceptance under the OPGGS (Environment) Regulations. The assessment was undertaken in accordance with the processes outlined in Sections 7.6 and 7.7 of this EP.

Following the assessment, it was concluded that, for the end state Option F (lower section left in place with cut line to achieve a minimum clearance of 26 metres below MSL, strut footings at HLA, KFA and KFB cut at a practical location with a minimum clearance of 26 metres), it could not be demonstrated that the impacts and risks to other users of the sea (particularly commercial vessels) could be reduced to acceptable levels. This was based on:

- the requirements of IMO Standard 3.6 (IMO Res. A.672(16), 1989), which state that "in cases of partial removal of a structure…an unobstructed water column sufficient to ensure safety of navigation, but not less than 55 metres, should be provided above any partially removed installation or structure which does not project above the surface of the sea". Thus, providing an unobstructed water column of 26 metres (or slightly deeper in the case of MKA and FLA) is not consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989)
- Consultation with the Australian Maritime Safety Authority (AMSA) noted that whilst ASMA do favour the benefits of full removal of existing infrastructure, from a safety of navigation perspective, a 55-metre clearance would be adequate and is considered consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989)

As a result of the assessment for acceptability and ALARP, the end state Option F (lower section left in place with cut line to achieve a minimum clearance of 26 metres below MSL, Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26 metres) was not taken forward as an option for the SPJ's.

3.6 Proposed Steel Piled Jacket end states

Based on the outcomes of the impacts and risks evaluation of the feasible options, the EOBO Assessment and the acceptability and ALARP evaluation, Table 3-11 presents the proposed SPJ end states for the 10 SPJs that are within the scope of this EP. For the purposes of assessment of this EP against the OPGGS (Environment) Regulations, these proposed end state concepts are defined as the 'petroleum activity'.

Table 3-11 Proposed Steel Piled Jacket end states

<table>
<tr><th rowspan="2">Facility</th><th colspan="5">End state option</th></tr>
<tr><th>BASE CASE Option C:
SPJ foundation piles left in place, with cut line below the seabed (large scale dredging assumed to be required)</th><th>Option D:
SPJ lower section (including strut footings where present) left in place, with cut line as close as practicable to the seabed (without large scale dredging of the seabed)</th><th>Option E:
SPJ Lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m</th><th>Option E plus placement:
SPJ lower section left in place with cut line to achieve a minimum clearance of 55m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 55m. Selected portions of the removed SPJs placed adjacent to the remaining lower sections.</th><th>Option F:
SPJ lower section left in place with cut line to achieve a minimum clearance of 26m below MSL. Strut footings at HLA, KFA and KFB will be cut at a practical location with a minimum clearance of 26m</th></tr>
<tr><td>Halibut (HLA)</td><td rowspan="10">Not selected – Option E will result in EOBO than Option C (the ‘base case’).</td><td rowspan="8">This Option results in an EOBO than Option C (the ‘base case’) however was not selected for these SPJs.</td><td rowspan="8">Selected – this Option results in an EOBO than Option C (the ‘base case’).</td><td rowspan="7">This Option will be carried forward for further consideration.</td><td rowspan="10">Not selected based on acceptability assessment discussed in Section 3.5.</td></tr>
<tr><td>Kingfish A (KFA)</td></tr>
<tr><td>Kingfish B (KFB)</td></tr>
<tr><td>Mackerel (MKA)</td></tr>
<tr><td>West Kingfish (WKF)</td></tr>
<tr><td>Cobia (CBA)</td></tr>
<tr><td>Flounder (FLA)</td></tr>
<tr><td>Fortescue (FTA)</td><td rowspan="3">Not selected - insufficient water depth.</td></tr>
<tr><td>Bream A (BMA)</td><td rowspan="2">Selected - this Option results in an EOBO than Option C (the ‘base case’).</td><td rowspan="2">Not selected – insufficient water depth.</td></tr>
<tr><td>Whiting (WTA)</td></tr>
</table>

3.7 Equal or Better Outcome discussion

The retention of the marine ecosystems that have established on and around the SPJs over the past 50 years has been assessed as the key differentiator between the 'base case' end state and the alternative end state options.

It has been repeatedly established in literature that offshore structures have the potential to attract, promote and support biodiversity (Advisian, 2022). This is the basis of rigs-to-reefs programs which are a well-established practice in the Gulf of Mexico and also applied globally (Bull & Love, 2019). Data obtained from long established offshore structures off California suggests these are some of the most productive habitats in the oceans (Claisse, et al., 2014). Reasons as to why offshore oil and gas structures support such rich marine ecosystems include:

- the construction of SPJs with multiple cross beams, support struts and vertical pilings (illustrated in Figure 3-15), which offer suitable hard surfaces for sessile (fixed to the platform) invertebrates such as mussels and barnacles, which in turn provide abundant food and shelter for both juvenile and adult fish (Neira, 2005)
- the vertical profile of the SPJs, which provides alternate microhabitats, with differences in light and temperature, from the seabed through the water column to the surface
- artificial offshore structures can unintentionally, provide a localised refuge from fishing activities (Fujii, 2015)
- in the marine environment, high relief (i.e. having more vertical features) and physically complex structures are associated with a higher abundance and diversity of marine organisms (Advisian, 2017).

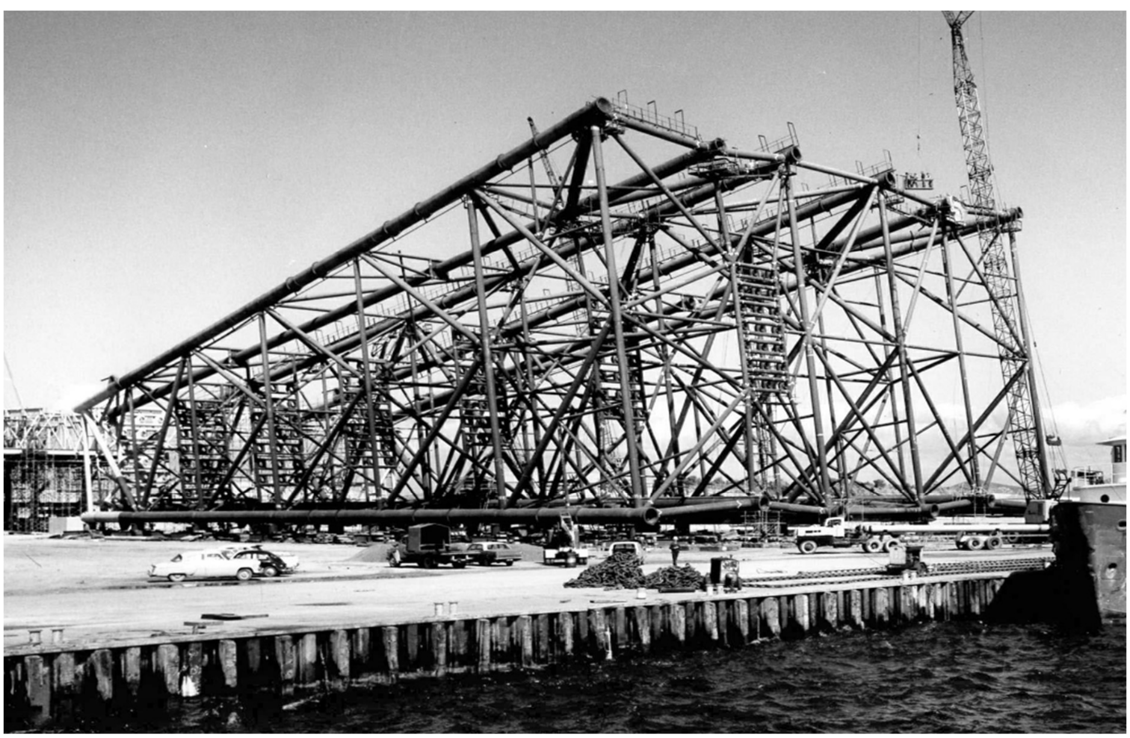


Figure 3-15 One of the Kingfish Steel Piled Jackets under construction at Barry Beach (1969)

The Esso facilities in Bass Strait are some of the oldest oil and gas structures in Australia, with the HLA, KFA and KFB SPJs installed in 1969. The Gippsland Basin is predominantly composed of a series of massive sediment flats, interspersed with small patches of natural reef and bedrock (Esso, 2009) and there is limited availability of hard habitats directly around the OAs ((Bax & Williams, 2001) cited in (Neira, 2005)). Hence it is expected that given the relative lack of hard substrate in the Gippsland Basin, the long period of time the SPJs have been present in the marine environment and the number of SPJs installed in a relatively small area, the SPJs are supporting an abundant and species rich marine ecosystem.

To support this position, an environmental survey of selected SPJs was completed in 2021. The ROV imagery collected during that survey (Environmental Survey 1 (Summer)) was reviewed by AIMS and a detailed review of historical ROV imagery collected was undertaken by Deakin University in 2020/2021 (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b).

These studies investigated the marine ecosystems associated with the SPJs to understand the ecological value of the SPJs and the potential consequences of decommissioning. The results of these studies are discussed in detail in Section 8.5 of this EP. In summary:

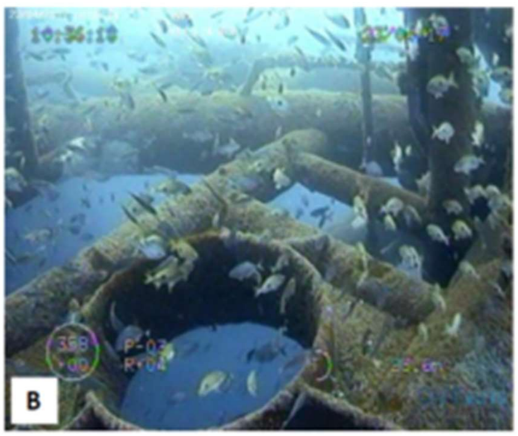
- biological communities associated with the SPJs more closely resemble near shore reef communities than that observed in the surrounding sandy bottom environment
- attached benthic communities were dominated by jewel anemones however the species diversity increased in the lower structure sections and notably included a variety of sponge species (typically greater than 60 metres water depth)
- a number of sponge species observed were not able to be identified. It was noted by AIMS that there is limited published information on sponge species found at depth in the Gippsland Basin and that preservation of these sponges would provide future research opportunities
- fish species richness and total abundance was found to be greatest in deeper waters (greater than 60 metres water depth)
- a much lower abundance of fish species was observed at reference locations (away from the platform) and at a natural reef present in the vicinity (South East Reef) when compared to that found at the SPJs
- important state and Commonwealth fishery species were observed at the SPJs, including jackass morwong (*Nemadactylus macropterus*), redfish (*Centroberyx affinis*), silver trevally (*Pseudocaranx georgianus*), banded morwongs (*Cheilodactylus spectabilis*) and southern rock lobster (*Jasus edwardsii*)
- Australian fur seals (EPBC Act-listed marine species) were commonly seen around the SPJs and swimming around the platform structure at all levels from the surface to the seabed. Foraging activity was observed.
- Analysis from Environmental Survey 1 (Summer) showed that the platforms surveyed are providing habitat for diverse fish communities and the fish assemblages observed on the platforms are unique for this offshore region of the Bass Strait and likely play an important role in the functioning of food webs in the area with representation of diverse trophic levels.

Figure 3-17 to Figure 3-19 provides a selection of imagery captured as part of the 2021 Environmental Survey 1 (Summer) and review of the historical ROV footage, illustrating some of the marine ecosystems present on and around the SPJs. Figure 3-18 and Figure 3-19 illustrate the comparison between the marine biota observed on and around the CBA and HLA SPJs and biota observed in the surrounding sandy bottom environment. If the SPJs were completely removed to below the seabed, it is expected the environment would, over time, return to the sandy bottom seabed environment observed during Environmental Survey 1 (Summer) at sites away from the immediate SPJ areas.

Further images are provided in Section 8.4 of this EP.

Rock lobsters shelter in the jacket at FTA

Seals observed at HLA.



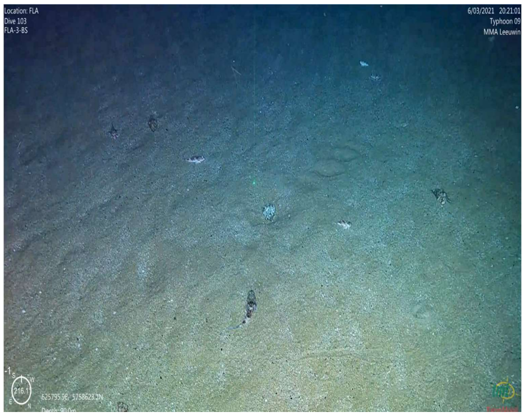
Fish species at WKF

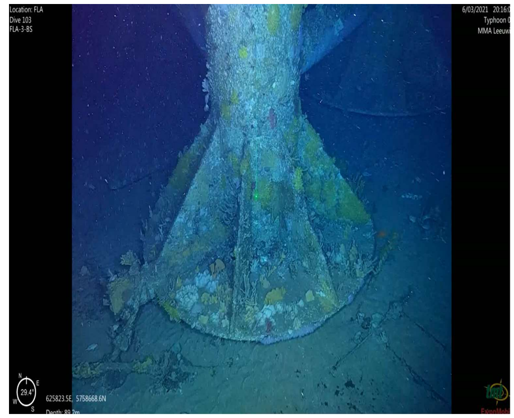
Red rock crabs, sponges and soft coral at KFB

Fish and sessile biota at KFB

Sea sweeps at FLA

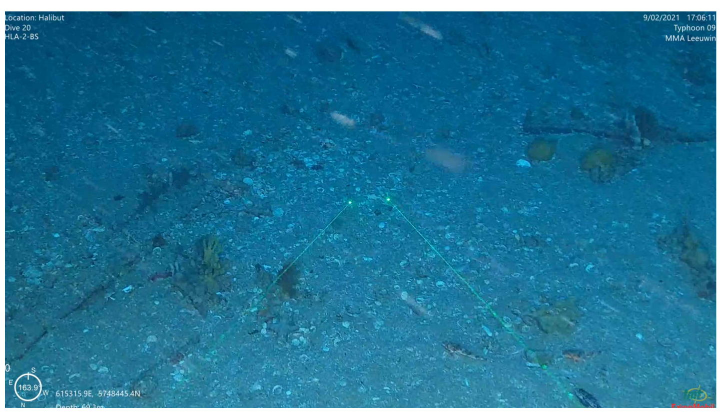
Figure 3-16 A selection of the marine ecosystems observed around the Steel Piled Jackets





Benthic surrounds around FLA

Benthic surrounds around KFA



Benthic surrounds around HLA

Figure 3-17 A selection of the sandy bottom marine ecosystems observed in the benthic surrounds around the Steel Piled Jackets

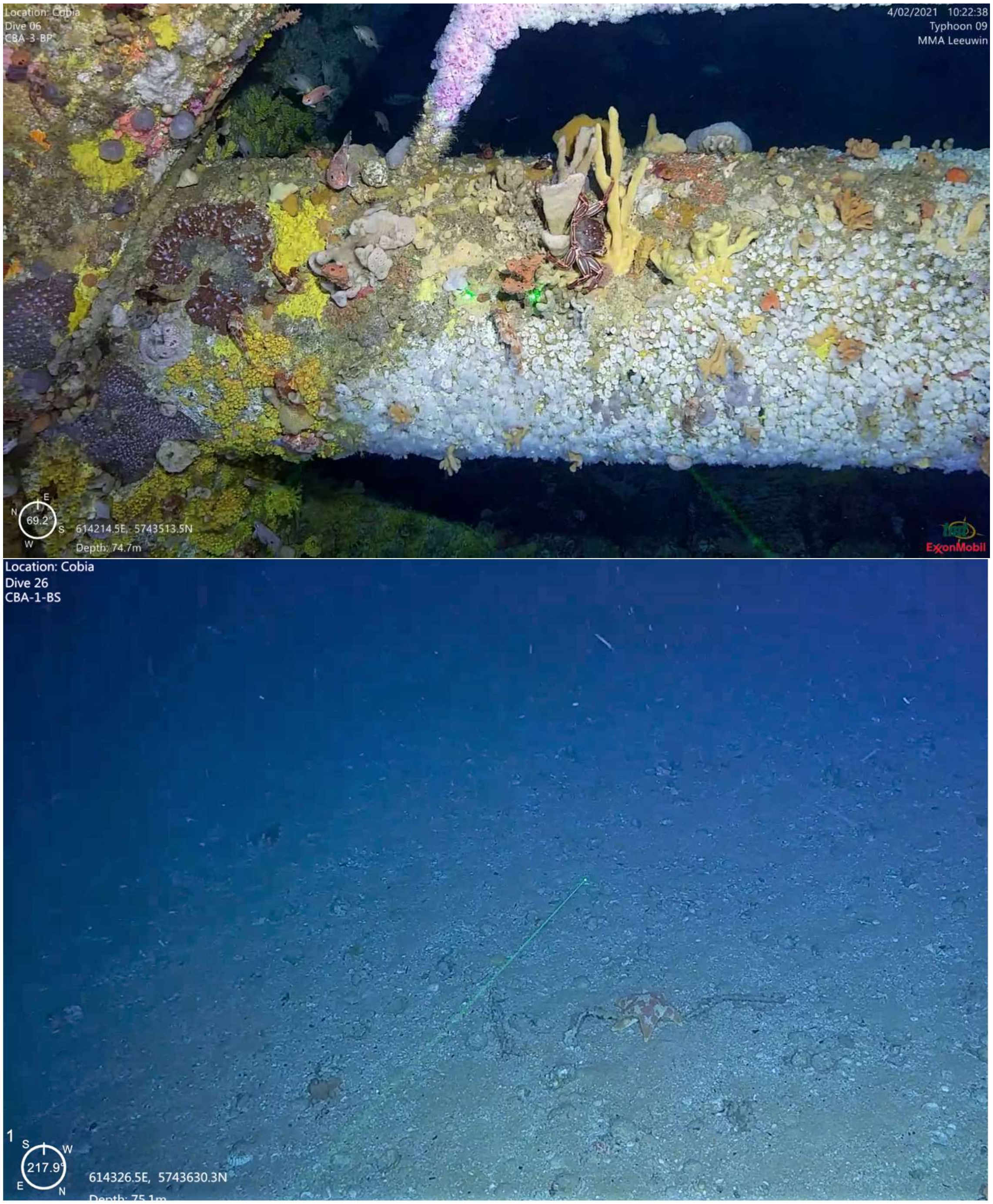


Figure 3-18 Flora and fauna observed at Cobia at 75 metres water depth (top) in comparison to the Cobia benthic surrounds at 75 metres water depth (bottom)

Figure 3-19 Flora and fauna observed at Halibut at 70 metres water depth (top) in comparison to the Halibut benthic surrounds around Halibut (bottom)

Scarbrorough Bull & Love (2019) state that the total removal of a platform structure will kill the majority of the organisms associated with the structure, causing a dramatic reduction in local species diversity and abundance. A study undertaken in the Gulf of Mexico (Claisse, et al., 2015) concluded that “on average 80 percent of fish biomass and 86 percent of secondary fish production would be retained after partial removal, with above 90 percent retention expected for both metrics on many platforms.”

Removing the SPJs to as close as practicable to the seabed will result in the loss of the majority of sessile (fixed to the structure) marine biota such as anemones, sponges, barnacles and crustacea, which in some instances cover the entire surface of the SPJs (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b).

Complete SPJ removal will destroy all sessile invertebrates, most invertebrate species, and some fish species associated with the SPJs. Any remaining fish surviving the direct removal of habitat, would have to disperse widely to find another habitat (Scarbrorough Bull & Love, 2019).

As sessile biota and marine flora attached to the SPJ provides habitat, feeding and spawning opportunities for marine biota such as fish, seals and larger predators, impacts to the behaviour, abundance and diversity of these species would also be expected.

In a survey of 200 global decommissioning experts, spanning academic, government, and private organizations (Fowler, et al., 2018), the majority (91.9 percent) agreed that 'if a group of installations may be ecologically interconnected, decommissioning options for these structures should be considered in combination rather than on an individual basis."

'Ecological connectivity' refers to the movement of organisms, materials and energy between habitat 'units', or areas, within the marine environment (Bishop, et al., 2017). Offshore structures can act as a conduit for the movement of species across an area, both between structures and natural habitats such as reefs. Scientific literature suggests that the removal of structures that have been in place for extended periods may disrupt ecological processes (Sommer, et al., 2019). The complete removal of all SPJs would likely represent a large-scale disturbance to marine biota in the Gippsland Basin, particularly if the SPJs are ecologically connected to each other, to other infrastructure in the Gippsland Basin and to any nearby 'natural' habitat features (i.e. the South East Reef).

In summary, in place decommissioning of the SPJs, where this is consistent with applicable international guidance to ensure the safety of navigation[3], maximises the retention of the marine ecosystems established on and around the SPJs, whilst also ensuring impacts and risks to other users of the sea are minimised.

Degradation of the remaining SPJs in the marine environment is expected to result in negligible environmental impacts due to the low concentrations estimated to result from the degradation of the SPJ constituents and the very slow rate of degradation over multiple centuries (Section 8.5 of this EP discusses the impacts of SPJ degradation in more detail).

Specific commercial fishing types which undertake deep- or mid-water trawling will continue to be excluded from the remaining SPJ footprint under all feasible options, however these areas are considered to be very small (0.8 square kilometres per SPJ) in comparison to the total extent of the Gippsland Basin (approximately 30,000 square kilometres). (Section 8.5 of this EP discusses the impacts to fishing in more detail).

Infrastructure remaining in place in the marine environment may provide a potentially suitable habitat for initial colonisation by an invasive marine species, or act as 'vectors' to facilitate the spread of introduced IMS to natural areas. No introduced IMS have been identified on any SPJ in either Environmental Survey 1 (Summer), or the review of historical ROV footage (refer to Section 9.4). No introduced IMS were identified in any infauna samples. The risk of either

[3] IMO Standard 3.6 (IMO Res. A.672(16), 1989) states that a clear water column of at least 55 metres should be provided in the case of partial removal to ensure safety of navigation.

of these events occurring has been assessed as low (Section 9.4 of this EP discusses this risk in more detail).

Hence it has been assessed that in place decommissioning of the SPJs, cut to a minimum of 55 metres below MSL for eight SPJs (HLA, FTA, CBA, MKA, KFA, KFB, WKF and FLA) will result in an EOBO than the 'base case' of removing the SPJs to below the seabed.

Where the water depth does not support partial removal to a minimum of 55 metres below MSL (i.e. WTA and BMA), the proposed SPJ end state is to remove these SPJs to as close as practicable to the seabed, to ensure that impacts and risks to other users of the sea are minimised.

3.8 End fate of removed sections of Steel Piled Jackets

Two options are still under consideration for the end fate of the upper sections of removed SPJs:

- End Fate option #1: removed SPJ sections taken to an ORC for dismantling and recycling/disposal (location is yet to be determined); and
- End Fate option #2: place some removed upper SPJ sections on the seabed adjacent to the SPJ lower sections remaining in place. This option (Option E plus placement in Table 3-11) has been taken forward for further consideration as the EOBO assessment concluded that this option results in an 'equal or better outcome' than the base case of complete removal.

Both of these options are assessed in this EP and described further in Section 4.5.1.

4 Description of the activity

4.1 Purpose of activity

The purpose of this EP is to gain acceptance of the proposed decommissioning end states of the Campaign #1 SPJs. As discussed in Section 1, the proposed end state for each SPJ differs from the requirement in the OPGGS Act Section 572(3), which is complete removal of all property. Therefore, the activity covered under this EP is the *demonstration* of an equal or better environmental outcome of the proposed end state for each SPJ, where the end state is not complete removal of all property. Refer to Section 3 for the process undertaken to select the end states.

The SPJs covered by this EP are HLA, FTA, CBA, MKA, KFA, KFB, WKF, FLA, BMA and WTA, as outlined in Section 1.2.1. For each of these SPJs (including foundation piles below the seabed and strut footings where present), an end state of complete removal is not proposed. Refer to Section 4.4 for details of each structure.

The items described in Sections 4.4.2 to 4.4.11 are:

- a description of each SPJ after the topsides are removed; and
- a description of each SPJs proposed end state, where the end state is not complete removal of all property (refer to Section 3.6).

Section 4.5.1 describes the options for the fate of the removed sections of the SPJs.

Section 1.3 describes the activities that are excluded from this EP. On this basis, this EP only describes the SPJs in Campaign #1 and assumes the following:

- all associated wells have been plugged and abandoned and conductors removed
- all pipelines have been cleaned and flushed
- complete topsides removal from all Campaign #1 SPJs has been completed
- pipeline risers and associated pipelines have been removed from each SPJ.

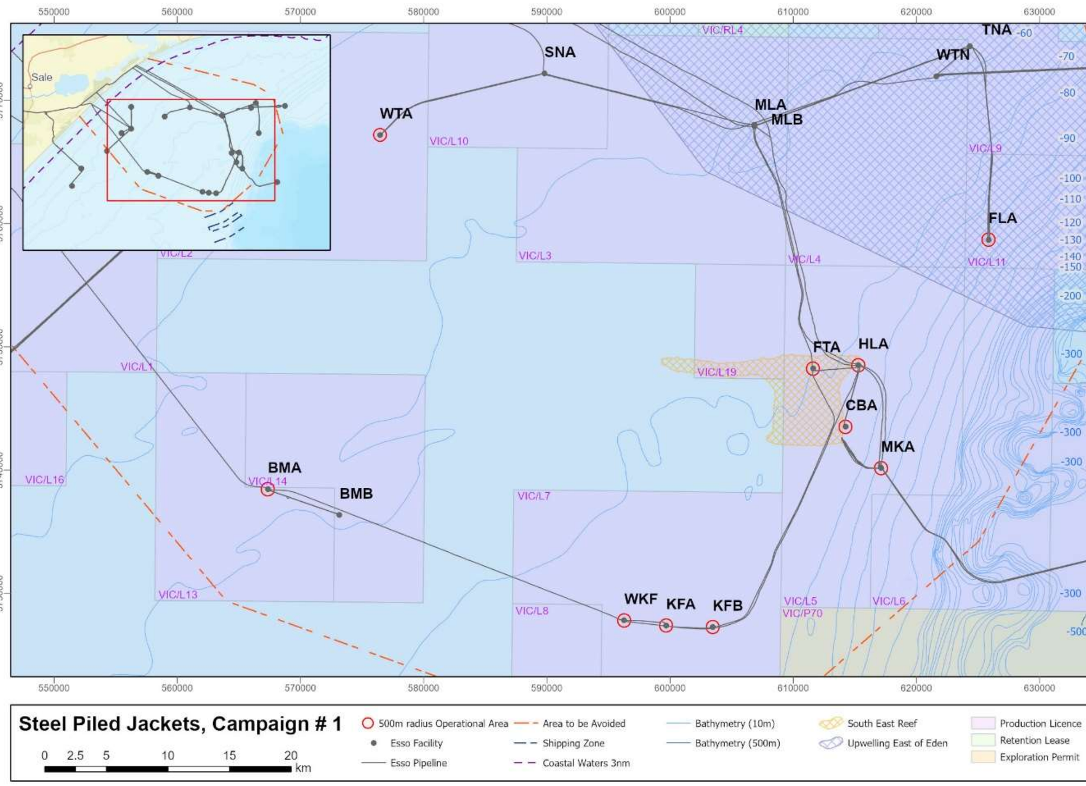
Execution of the decommissioning activities to achieve the end states will be covered by a subsequent Campaign #1 SPJs – End State EP.

4.2 Location of the activity

The Gippsland Basin is located in Bass Strait, offshore Victoria’s southern coast. The Esso facilities and title areas covered by Campaign #1 are shown in Figure 1-6. This EP only covers the SPJs in Campaign #1 as defined in Section 1.2.1 and Table 4-1.

4.3 Operational Areas

As per Section 5, the 'OAs’ for each SPJ is are defined as the areas encompassing a 500-metre radius around each of the 10 SPJs covered by this EP. Table 4-1 shows the locations of these SPJs and Figure 4-1 shows the extent of the OAs within Bass Strait.



Note: All Esso facilities (per this figure) have a 500m radius Petroleum Safety Zone.
For illustrative purposes, only the SPJs and their respective OA as covered by this EP are highlighted in this figure.

Figure 4-1 Operational Area for each Steel Piled Jacket in Campaign #1

Table 4-1 Location of Steel Piled Jacket

Production Licence No.	Facility name	Code	Distance from coast (km)	Water depth (m)	Latitude	Longitude
VIC/L02	Whiting	WTA	34	54	38° 14' 29" S	147° 72' 20" E
VIC/L05	Halibut	HLA	63	73	38° 24' 20" S	148° 19' 07" E
VIC/L05	Fortescue	FTA	62	69	38° 28' 50" S	148° 20' 28" E
VIC/L05	Cobia	CBA	68	78	38° 24' 32" S	148° 16' 36" E
VIC/L05	Mackerel	MKA	72	93	38° 27' 04" S	148° 18' 28" E
VIC/L07	Kingfish A	KFA	75	77	38° 35' 51" S	148° 08' 35" E
VIC/L07	Kingfish B	KFB	77	78	38° 35' 54" S	148° 11' 11" E
VIC/L07	West Kingfish	WKF	72	76	38° 35' 39" S	148° 06' 15" E
VIC/L11	Flounder	FLA	58	93	38° 18' 44" S	148° 26' 16" E

Production Licence No.	Facility name	Code	Distance from coast (km)	Water depth (m)	Latitude	Longitude
VIC/L13	Bream A	BMA	46	59	38° 30' 03" S	147° 46' 15" E

4.4 Description of property

A detailed inventory of the property to be decommissioned in accordance with this EP is provided in Appendix A1.

4.4.1 Steel Piled Jacket construction materials

4.4.1.1 Steel

The construction material of the SPJs in Campaign #1 is majority steel. The steel material for all SPJs and piles was fabricated and provided by BHP Steel with the SPJs installed from 1968 (HLA) to 1987 (BMA) (refer to Table 1-2). The Australian Standard steel material codes for the time show that steels used were initially in line with AS A.149-1965 and AS A.157-1966, with subsequent BHP Steel catalogue 1974, showing AS 1204 (1972) [17] and AS 1205 (1972). A consolidated composition is used to provide an indicative composition of the grade and its constituents (Table 4-2 (Kent Plc, 2022)). This composition is compiled taking the highest value of each element used in all relevant 250 and 350 grades defined in the standards (Kent Plc, 2022). A detailed list of these constituents and the total mass proposed to remain in place is provided in Appendix A3, Appendix A4 and Appendix A5.

Table 4-2 Steel composition of jackets (compiled) estimating highest content of each element

Component	Weight %**
Iron	98
Carbon	0.25
Phosphorus	0.15
Manganese	1.5
Silicon	0.70
Sulphur	0.04
Nickel	0.50
Chromium	1.00
Copper	0.45
Other+	0.15

** Total weight exceeds 100% as elements are the highest from different grades.
+ Typical constituents will be a combination of grain refining and micro alloying components such as aluminium, niobium, molybdenum, vanadium, titanium, calcium, cerium, tin, nitrogen and boron. These are unlikely that any will exceed 0.03% weight.

4.4.1.2 Cement grout

The cement grout material (cementitious grout) used to secure the footings, skirts and piles makes up the majority of the remaining material after the steel. Cementitious grout is made from ordinary cement mixed with fresh water and a fine mineral aggregate such as sand, silica fume, pulverised fly ash, bentonite or barytes depending upon the required strength, density and shrinkage characteristics. Occasionally, other chemical additives are designed into the mix e.g. set retarders, accelerators and non-shrink (i.e. expansion) agents. Generally, these are respectively lignins, calcium chloride, and aluminium powder. Of these only lignins are organic and would have been fully reacted in the body of cement grout shortly after placing and setting (Kent Plc, 2022).

4.4.1.3 Anodes

All SPJs are fitted with cathodic protection systems which are devices that protect structures and metalwork from corrosion. After the installation of the first three SPJs, (HLA, KFA and KFB) which used induced current cathodic protection (ICCP) from the time of installation, the subsequent platforms initially used sacrificial anode cathodic protection (SACP) and were subsequently fitted with ICCP systems. The only exception is WTA for which an ICCP was never installed and the structure remains with the SACP system.

Anodes have been identified as aluminium-based indium activated alloy (mercury has not been used in anodes on SPJs in Bass Strait). As for the steel, the composition of the relevant Australian Standard codes from the time of construction are used to summarise the composition of the anodes (Table 4-3 (Kent Plc, 2022)). There are two compositions presented which may have been used, types designated A1 and A2.

Table 4-3 Anode composition (compiled) estimating highest content of each element

Element	Composition weight %**				
	Designation A1		Designation A2		Overall max
	Min	Max	Min	Max	
Zinc	2.1	2.7	3.0	5.0	5.0
Indium	0.017	0.025	0.02	0.05	0.05
Cadmium	0.008	0.012	-	-	0.012
Silicon	0.05	0.20	0.05	0.20	0.20
Iron	-	0.15	-	0.15	-
Magnesium	-	-	0.6	2.2	2.2
Titanium	-	-	0.02	0.05	0.05
Copper	-	0.006	-	0.006	0.005
Other total	-	0.05	-	0.05	0.05
Aluminium	96.857	97.825	92.294	96.31	97.825

** Total weight exceeds 100% as elements are the highest from different designations.

4.4.1.4 Other

Other components, located below the topsides, which are considered potential contaminant sources and exist on the SPJs are skimmer piles and chemical or fuel tanks. These have been either purpose built (in the case of some skimmer piles) or converted for this purpose. Some SPJs (FTA, FLA, BMA, WKF, CBA and MKA) had buoyancy tanks which were only needed for installation. In some cases, these buoyancy tanks were converted into storage tanks (chemical, fuel and potable water) or skimmer piles. Other pile types are converted well conductors and converted skirt pile followers. All of these skimmer piles and tanks will be fully removed as part of the removal of the SPJ upper sections and transported to an ORC for dismantling and processing for disposal. SPJs that did not have the buoyancy tanks have all their storage tanks on the topsides which will be fully removed (refer to Section 4.1). All the components considered as potential contaminant sources associated with the SPJs (those located below the topsides) will also be fully removed. These are itemised under the description of each SPJ in the following sections.

Other minor components which will also be removed with the upper sections are the epoxy coating or monel wraps on the splash zone of each SPJ. Both the epoxy coating and the monel wraps are used for corrosion protection. Monel wraps are made of a nickel/copper alloy which has a very low corrosion rate in (Kent Plc, 2022). No plastics are associated with the remaining SPJ structures under the proposed end states.

4.4.2 Halibut (HLA)

The HLA SPJ has 16 legs and a strut. The strut was installed post installation of the SPJ to provide additional support to the structure.

Figure 4-2 shows the HLA SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right). With a 55-metre clearance below MSL the remaining structure would have an elevation above seabed of approximately 18 metres or less for the lower section and 13 metres or less for the strut. The deep foundation piles and strut footings would remain intact and extend to approximately 145 metres below the seabed. Table 3-4 provides details of the foundation pile configurations for HLA. The foundation pile construction materials are steel and cement grout. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

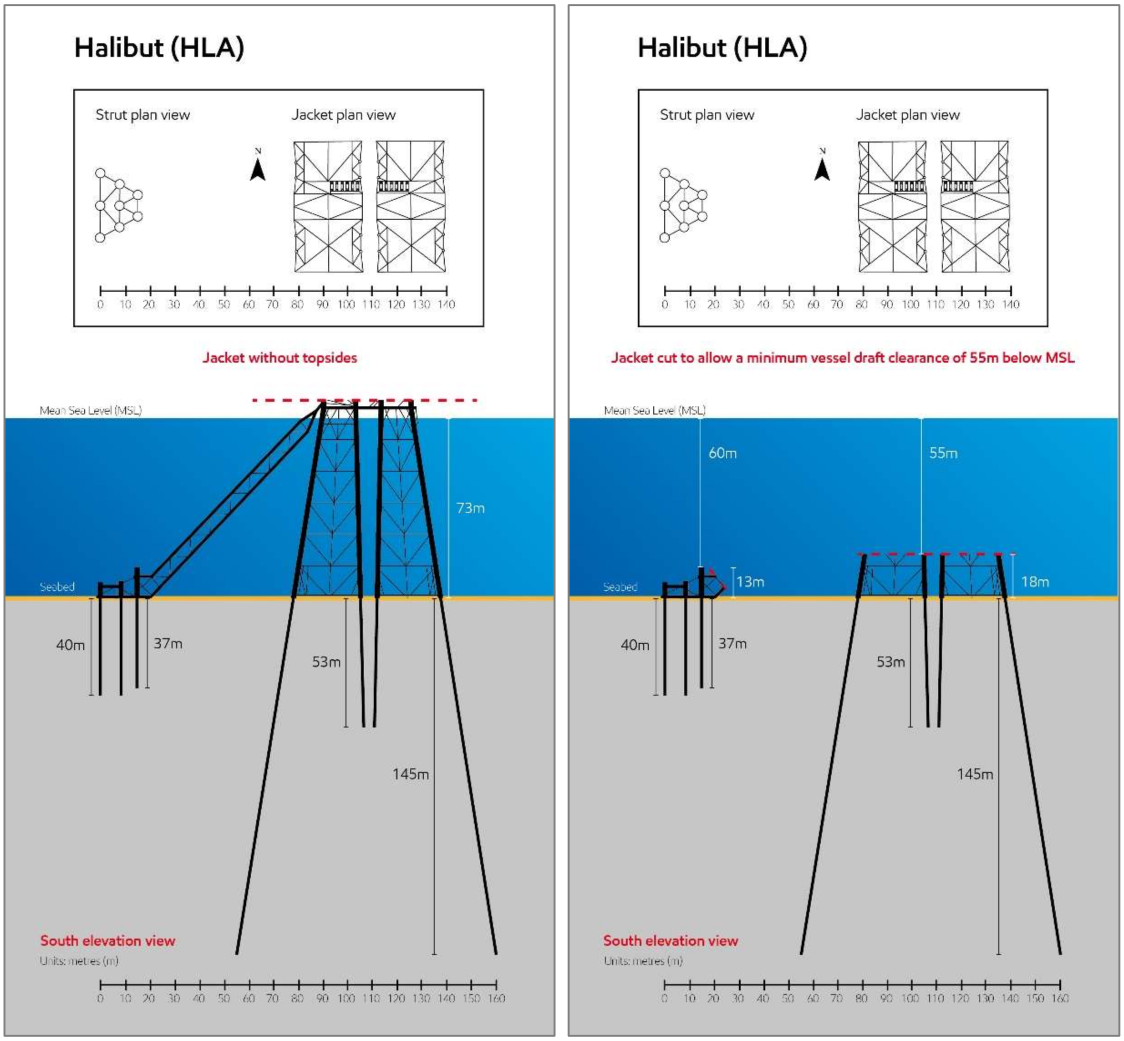


Figure 4-2 Halibut Steel Piled Jacket without topsides (left) and under proposed end state (right)

Where SPJs have skimmer piles and storage tanks used for chemical or fuel storage which are located below the MSL, they will be fully removed together with the upper section of the SPJ.

Table 4-4 summarises the skimmer piles that will be fully removed together with the upper section of the SPJ (refer to Section 4.4.1.4). The HLA SPJ does not have leg tanks (refer to Section 4.4.1.4). Storage tanks for chemicals or fuels are located on the topside of the platform which will be fully removed.

Table 4-4 Halibut Steel Piled Jacket skimmer piles and storage tanks located below the topside

SPJ	Jacket leg storage tanks			Skimmer piles	
	Diesel	Glycol	Methanol	Open	Closed
HLA	No jacket leg tanks			1	1

4.4.3 Fortescue (FTA)

The FTA SPJ has eight legs. Figure 4-3 shows the FTA SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right). With a 55-metre clearance below MSL the lower section would have an elevation above seabed of approximately 14 metres or less. The deep foundation piles would remain intact and extend to approximately 102 metres below the seabed. The foundation pile construction materials are steel and cement grout. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

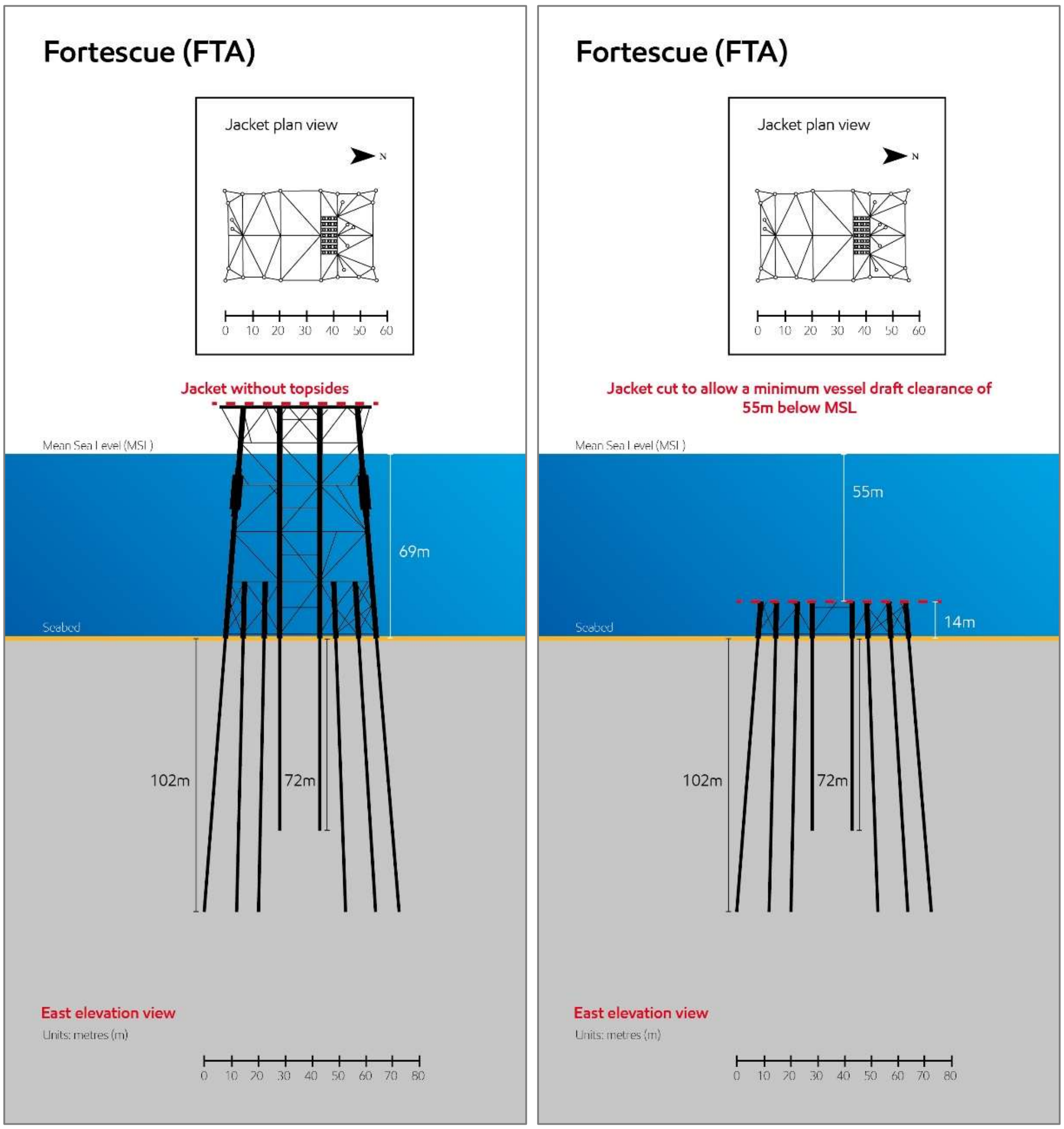


Figure 4-3 Fortescue Steel Piled Jacket without topsides (left) and under proposed end state (right)

Table 4-5 summarises the storage tanks and skimmer piles located below the topside that will be removed together with the upper section of the SPJ (refer to Section 4.4.1.4).

Table 4-5 Fortescue Steel Piled Jacket skimmer piles and storage tanks located below the topside

SPJ	Jacket leg storage tanks			Skimmer piles	
	Diesel	Glycol	Methanol	Open	Closed
FTA	1	Nil	Nil	1	1

4.4.4 Cobia (CBA)

The CBA SPJ has eight legs. Figure 4-4 shows the CBA SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right).

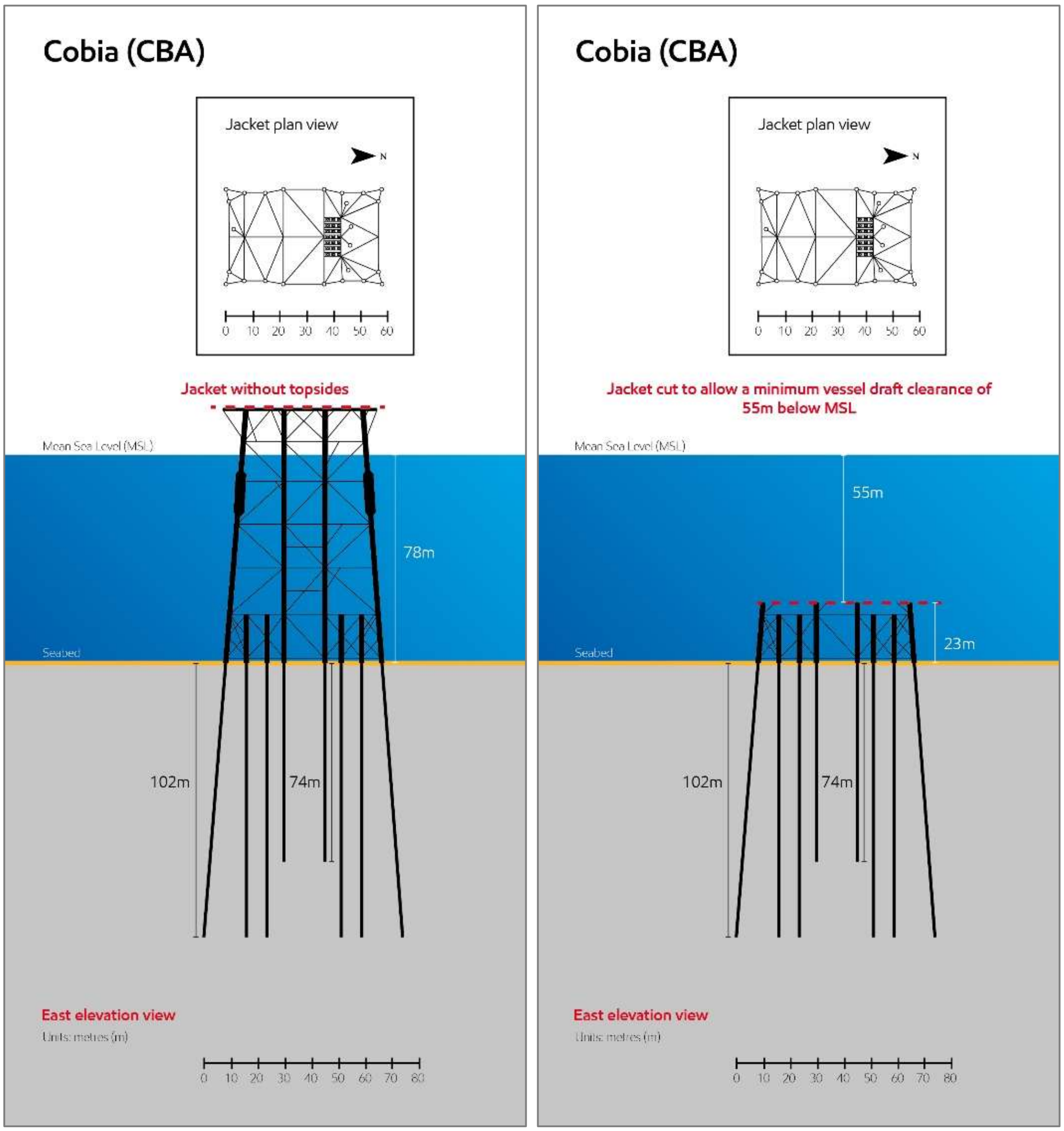


Figure 4-4 Cobia Steel Piled Jacket without topsides (left) and under proposed end state (right)

With a 55-metre clearance below MSL the lower sections would have an elevation above seabed of approximately 23 metres. The deep foundation piles would remain intact and extend to approximately 102 metres below the seabed. The foundation pile construction materials are steel and cement grout. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

Table 4-6 summarises the storage tanks and skimmer piles located below the topside that will be fully removed together with the upper section of the SPJ (refer to Section 4.4.1.4).

Table 4-6 Cobia Steel Piled Jacket skimmer piles and storage tanks located below the topside

SPJ	Jacket leg storage tanks			Skimmer piles	
	Diesel	Glycol	Methanol	Open	Closed
CBA	1	Nil	Nil	1	1

4.4.5 Mackerel (MKA)

The MKA SPJ has eight legs. Figure 4-5 shows the MKA SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right). With a 55-metre clearance below MSL the lower section would have an elevation above seabed of approximately 38 metres. The deep foundation piles would remain intact and extend to approximately 102 metres below the seabed. The foundation pile construction materials are steel and cement grout. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

Table 4-7 summarises the storage tanks and skimmer piles located below the topside that will be fully removed together with the upper section of the SPJ (refer to Section 4.4.1.4).

Table 4-7 Mackerel Steel Piled Jacket skimmer piles and storage tanks located below the topside

SPJ	Jacket leg storage tanks			Skimmer piles	
	Diesel	Glycol	Methanol	Open	Closed
MKA	Nil	Nil	1	1	1

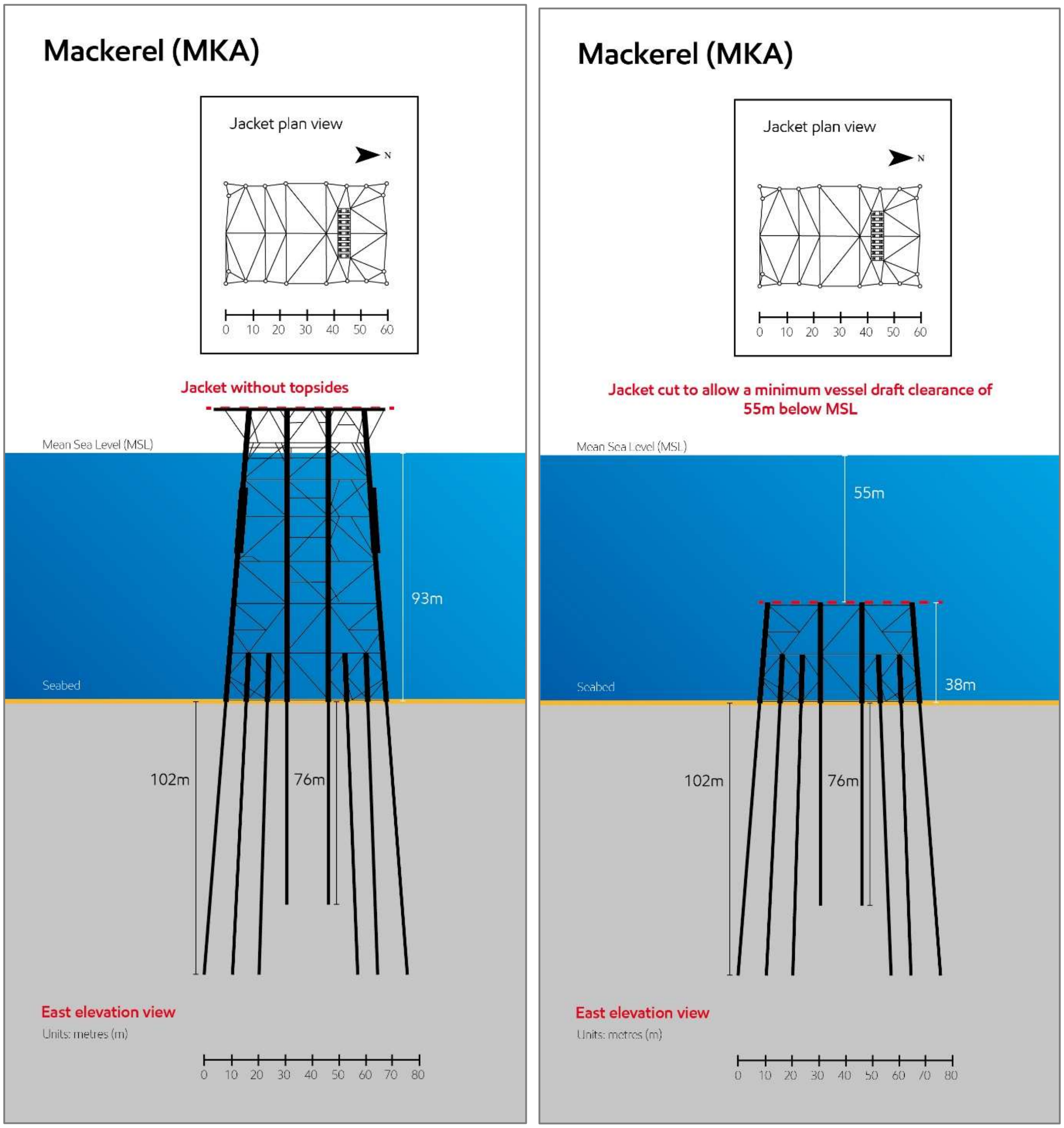


Figure 4-5 Mackerel Steel Piled Jacket without topsides (left) and under proposed end state (right)

4.4.6 Kingfish A (KFA)

The KFA SPJ has eight legs and a strut. The strut was installed post installation of the jacket to provide additional support to the structure.

Figure 4-6 shows the KFA SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right). With a 55 metres clearance below MSL the remaining structure would have an elevation above seabed of approximately 22 metres or less for the lower section and 15 metres for the strut footings. The deep foundation piles and footings for the strut would remain intact and extend to approximately 156 metres below the seabed. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

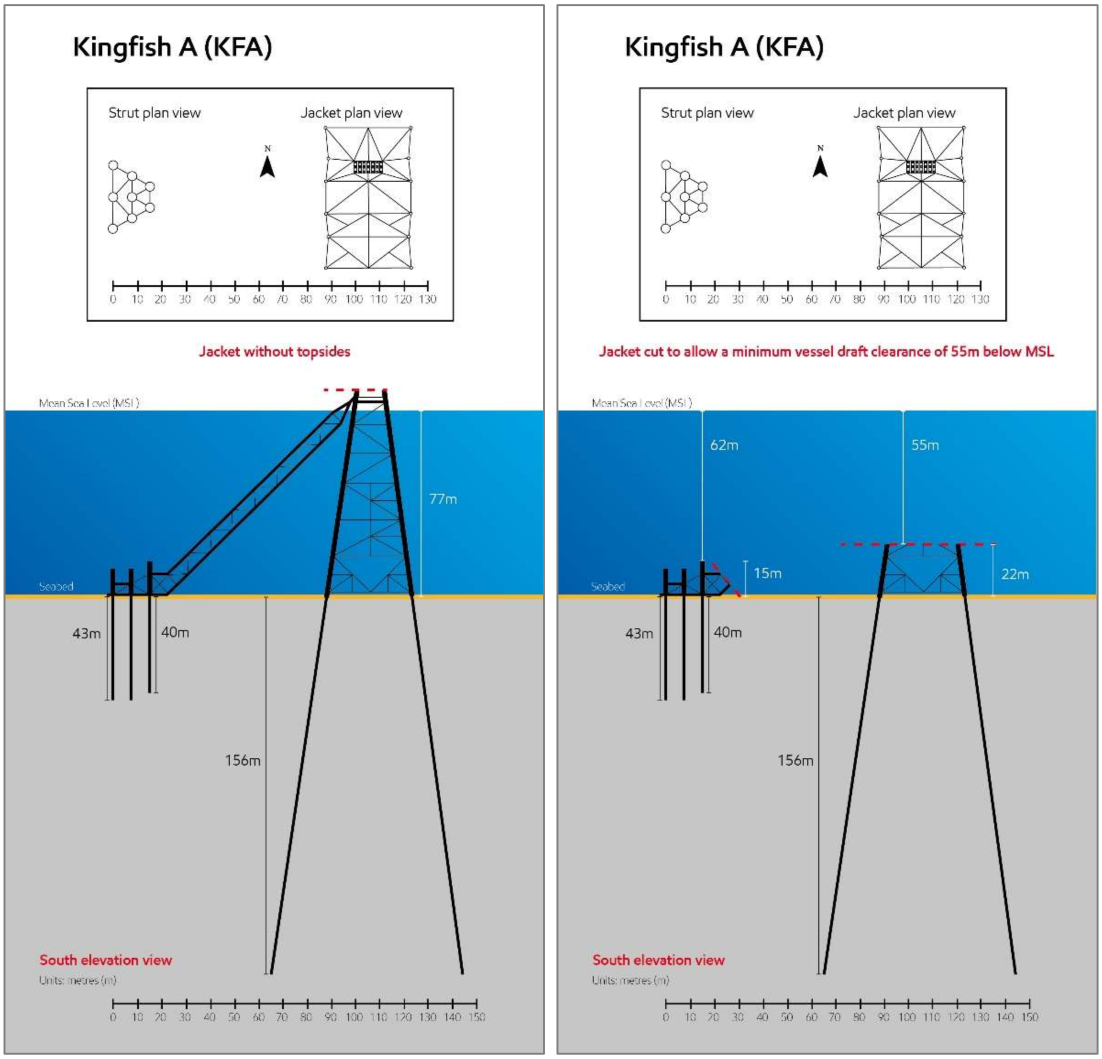


Figure 4-6 Kingfish A Steel Piled Jacket without topsides (left) and under proposed end state (right)

Table 4-8 summarises the skimmer piles that will be removed together with the upper section of the jacket (refer to Section 4.4.1.4). KFA SPJ does not have jacket leg tanks (refer to Section 4.4.1.4). Storage tanks for chemicals or fuels are located on the topside of the platform which will be fully removed.

Table 4-8 Kingfish A Steel Piled Jacket skimmer pile and storage tanks located below the topside

SPJ	Jacket leg storage tanks			Skimmer piles	
	Diesel	Glycol	Methanol	Open	Closed
KFA	No jacket leg tanks			1	1

4.4.7 Kingfish B (KFB)

The KFB SPJ has eight legs and a strut. The strut was installed post installation of the SPJ to provide additional support to the structure.

Figure 4-7 shows the KFB SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right). With a 55-metre clearance below MSL the lower section would have an elevation above seabed of approximately 23 metres or less for the lower section and 15 metres for the strut. The deep foundation piles and footings for the strut would remain intact and extend to approximately 156 metres below the seabed. The foundation pile construction materials are steel and cement grout. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

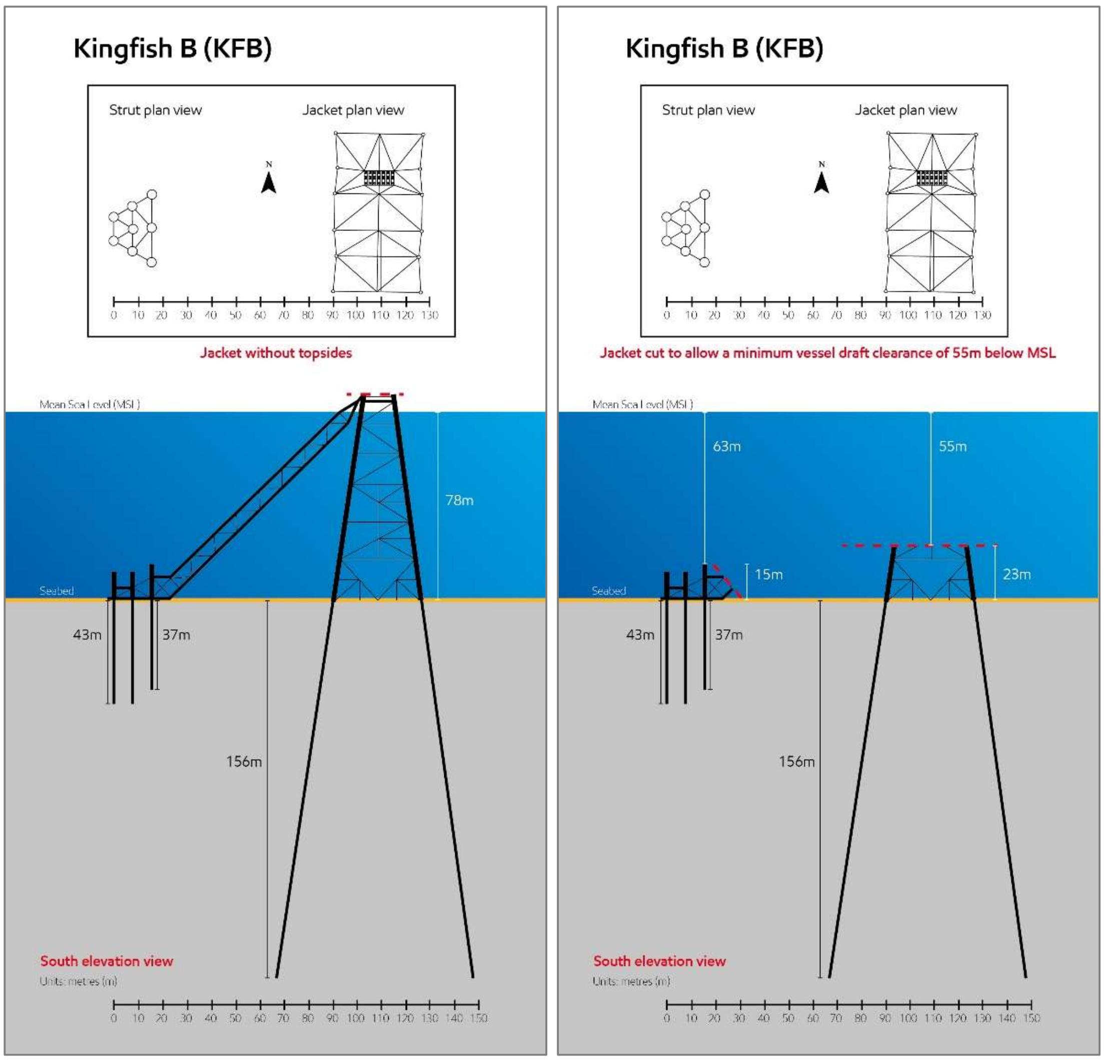


Figure 4-7 Kingfish B Steel Piled Jacket without topsides (left) and under proposed end state (right)

Table 4-9 summarises the skimmer piles that will be removed together with the upper section of the SPJ (refer to Section 4.4.1.4). KFB SPJ does not have leg tanks (refer to Section

4.4.1.4). Storage tanks for chemicals or fuels are located on the topside of the platform which will be fully removed.

Table 4-9 Kingfish B Steel Piled Jacket skimmer piles and storage tanks located below the topside

SPJ	Jacket leg storage tanks			Skimmer piles	
	Diesel	Glycol	Methanol	Open	Closed
KFB	No jacket leg tanks			1	1

4.4.8 West Kingfish (WKF)

The WKF SPJ has eight legs. Figure 4-8 shows the WKF SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right). With a 55-metre clearance below MSL the lower section would have an elevation above seabed of approximately 21 metres or less. The deep foundation piles would remain intact and extend to approximately 103 metres below the seabed. The foundation pile construction materials are steel and cement grout. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

Table 4-10 summarises the skimmer piles and storage tanks located below the topside that will be fully removed together with the upper section of the SPJ (refer to Section 4.4.1.4).

Table 4-10 West Kingfish Steel Piled Jacket skimmer piles and storage tanks located below the topside

SPJ	Jacket leg storage tanks			Skimmer piles	
	Diesel	Glycol	Methanol	Open	Closed
WKF	1	Nil	Nil	1	1

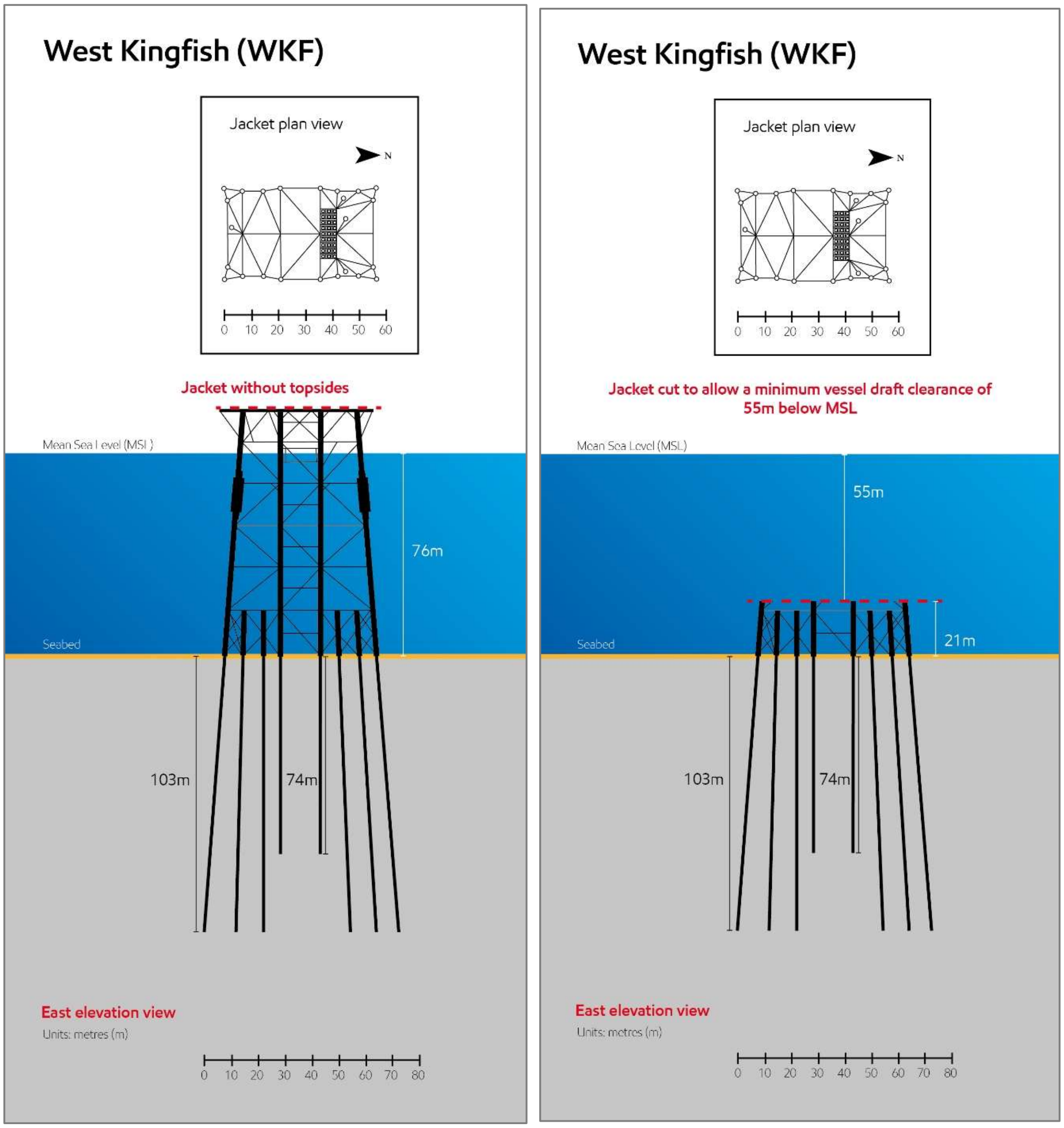


Figure 4-8 West Kingfish Steel Piled Jacket without topsides (left) and under proposed end state (right)

4.4.9 Flounder (FLA)

The FLA SPJ has eight legs. Figure 4-9 shows the FLA SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right). With a 55-metre clearance below MSL the lower sections would have an elevation above seabed of approximately 38 metre or less. The deep foundation piles and footings for the strut would remain intact and extend to approximately 122 metres below the seabed. The foundation pile construction materials are steel and cement grout. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

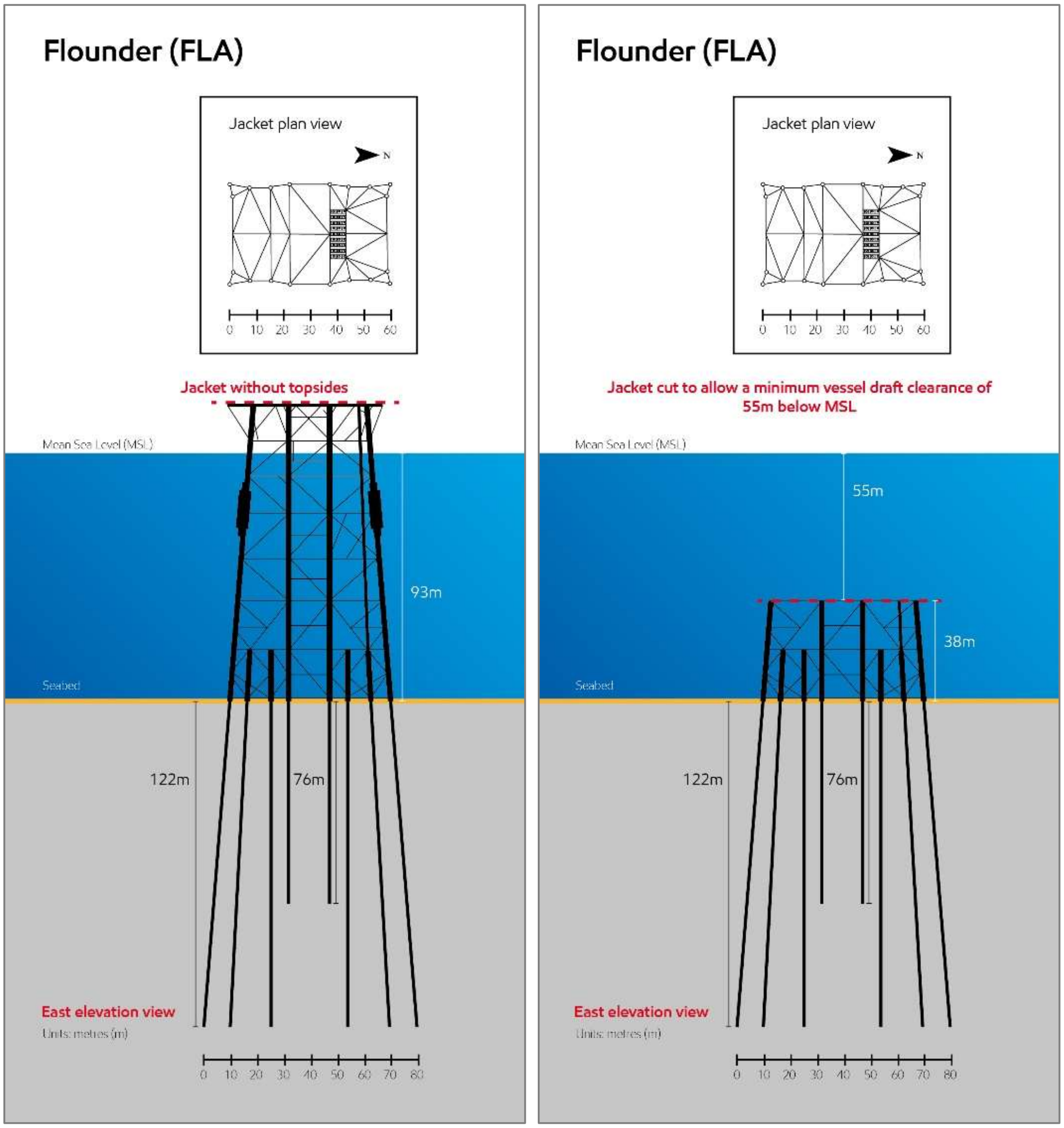


Figure 4-9 Flounder Steel Piled Jacket without topsides (left) and under proposed end state (right)

Table 4-11 summarises the skimmer piles and storage tanks located below the topside that will be fully removed together with the upper section of the SPJ (refer to Section 4.4.1.4).

Table 4-11 Flounder Steel Piled Jacket skimmer piles and storage tanks located below the topside

SPJ	Jacket leg storage tanks			Skimmer piles	
	Diesel	Glycol	Methanol	Open	Closed
FLA	Nil	1	Nil	1	1

4.4.10 Bream A (BMA)

The BMA SPJ has eight legs. Figure 4-10 shows the BMA SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right). The proposed end state is to cut the SPJ as close as practicable to the seabed (without large scale dredging). This could result in the decommissioned structure having an estimated elevation above seabed of approximately 0-5 metres. The final elevation for this option will be dependent on the technical feasibility of cutting methods which may include internal or external cuts (refer Section 3). The deep foundation piles would remain intact and extend to approximately 107 metres below the seabed. The foundation pile construction materials are steel and cement grout. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

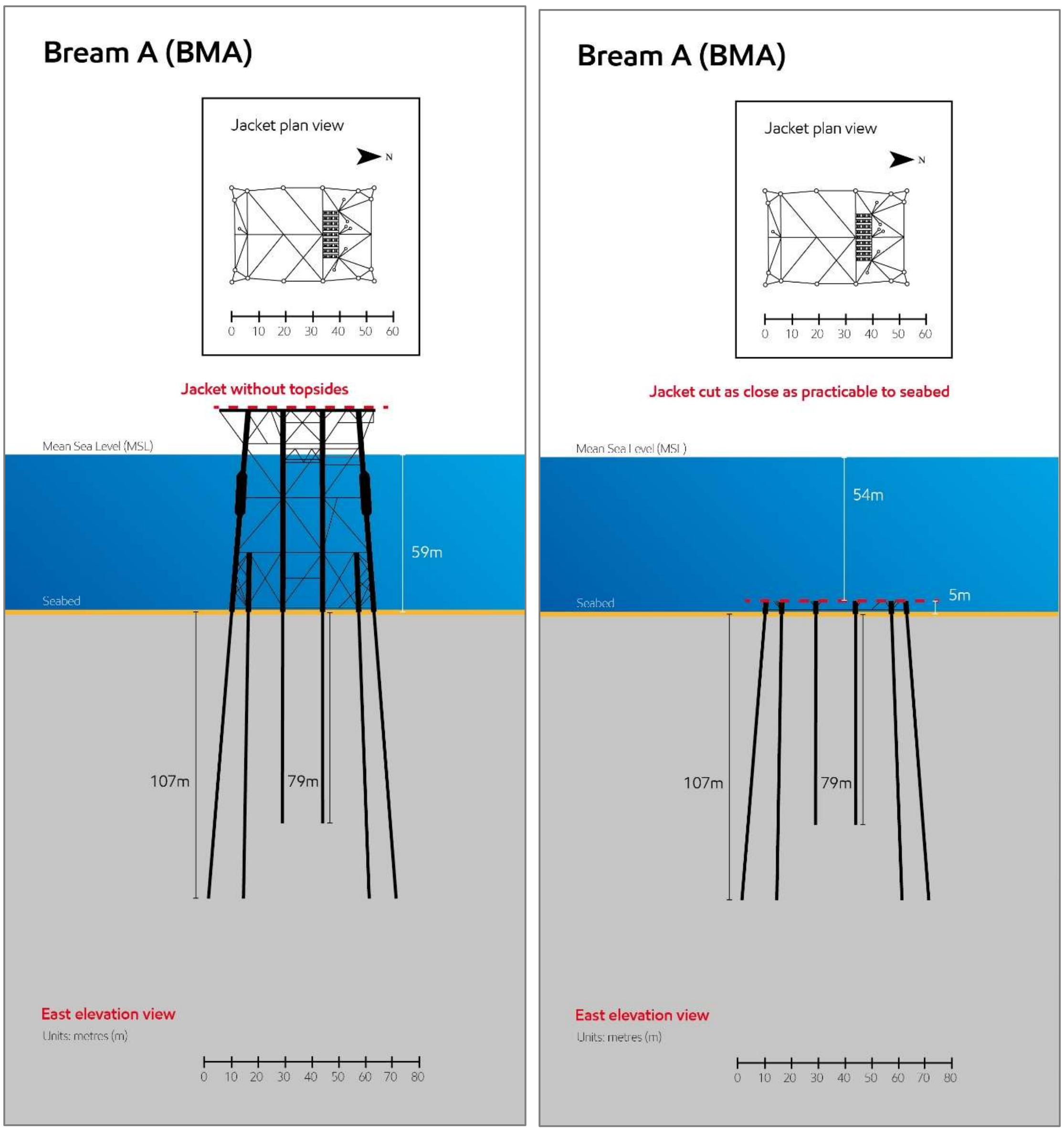


Figure 4-10 Bream A Steel Piled Jacket without topsides (left) and under proposed end state (right)

4.4.11 Whiting (WTA)

The WTA SPJ has four legs. Figure 4-11 shows the WTA SPJ prior to decommissioning (left) and under the proposed end state, which would remain post decommissioning (right). The proposed end state for WTA is to cut the SPJ as close as practicable to the seabed (without large scale dredging). This could result in the decommissioned structure having an estimated elevation above seabed of between approximately 0-5 metres. The final elevation for this option will be dependent on the technical feasibility of cutting methods which may include internal or external cuts (refer to Section 3.2.5.2). The deep foundation piles would remain intact and extend to a maximum of 85 metres below the seabed. The foundation pile construction materials are steel and cement grout. The estimated weights of the materials to remain both above and below the seabed for the proposed end state are provided in Appendix A3, Appendix A4 and Appendix A5.

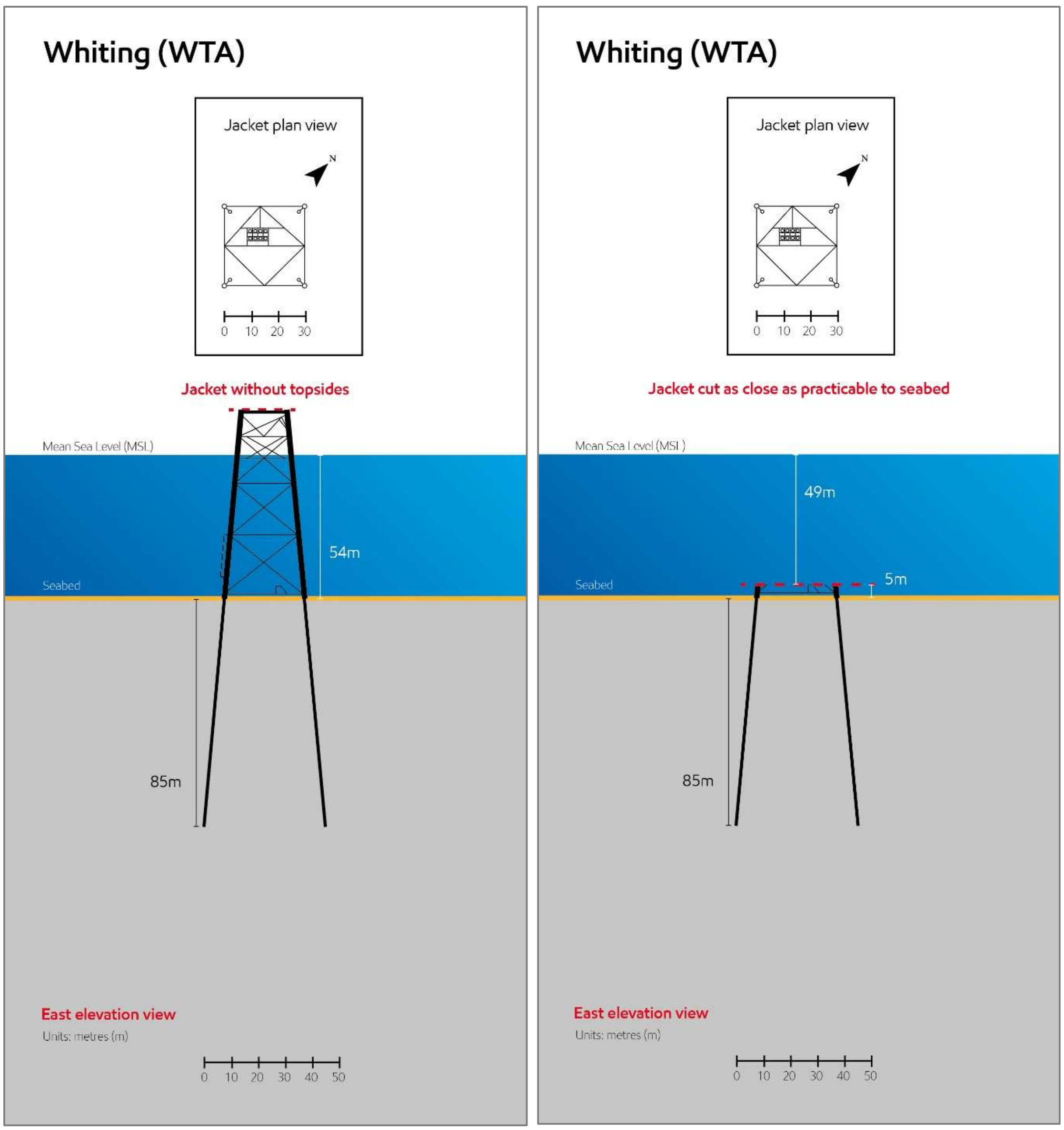


Figure 4-11 Whiting Steel Piled Jacket without topsides (left) and Steel Piled Jacket under proposed end state (right)

4.5 Fate of removed sections of Steel Piled Jackets

Two options are being carried forward for the removed sections of SPJs as described in Section 3.8. The first option is to transport all removed sections to an onshore location for further processing, and the second is placement of some sections on the seabed adjacent to the existing structure.

4.5.1 Seabed placement

The seabed placement option has been selected for further consideration as this would provide additional hard substrate habitat to supplement that provided by retaining the SPJ lower sections, and further enhance secondary productivity which would support species higher up the food chain A study undertaken in 2019 (Rouse, Porter, & Wilding, 2019), investigated the effects of artificial reef design on secondary productivity and concluded that the productivity rates of a common suspension feeder, a bryzoan (*Flustra foliacea)*, were 2.4 times higher on artificial reefs constructed from “complex” blocks than on reefs constructed from “simple” blocks, which had a smaller surface area. As shown in Section 1.2.2 , the SPJs are complex three dimensional structures with a multitude of cross beams and an ‘openness’ that allows for water circulation, oceanic energy dissipation, and easy mobility for fishes (Love and Bull, 2019). These structural characteristics provide the complexity needed to establish a community across trophic levels (International Association of Oil and Gas Producers, 2022). The effects of artificial reef structures are frequently viewed as positive environmental change, or as mitigation against negative consequences that may arise from marine developments (Gill A. B., 2005). Assessment of imagery during Environmental Survey #1 (Summer) and the review of historic ROV footage has confirmed that there are abundant and well established novel ecosystems at all platforms. These ecosystems have been present in the marine environment for many decades (some up to 50 years) and appear stable in composition (as evidenced by the review of historic ROV footage).

SPJ sections, removed from the upper water column and placed as close as practicable to the remaining SPJ lower sections, would increase the complexity of the artificial reef retained by decommissioning the lower sections of the SPJs in place, thus providing the opportunity for increased biological community retention and development. Provision of additional colonising surfaces, feeding opportunities and shelter would be expected to increase the abundance of benthic sessile organisms and other marine species. This would occur following a period of change of the community structure as organisms adjust from the shallower water, more light dependent environment which exists on the upper parts of the existing SPJ structures, to a deeper, lower light environment.

The enhancement to the benthic habitat afforded by the placement of the SPJ sections would supplement the ecological and potential economic (in terms of enhancement of fisheries stock) values of the lower sections remaining in place. Esso is undertaking studies (refer to Section 8.4.6.2) and will continue to engage with commercial and recreational fishery relevant persons to further understand the potential value to fisheries as a result of retaining the SPJs in place and the option for seabed placement of the removed SPJ upper sections.

The placement of removed sections of the SPJ on the seabed adjacent to the existing structure is only considered feasible where the following criteria are met[4]:

- the cut section of the SPJ must not include any components deemed to be contaminants. These include skimmer piles, tanks used for hydrocarbon or chemical storage, sections of the SPJ in the splash zone which have protective epoxy coatings or monel wraps, and
- the removed section must be of a height such that placement must ensure a 55 metre clearance below MSL, consistent with the base criteria of the proposed end states for the SPJs.

Where removed sections of the SPJ meet these criteria, the location for placement must meet the following:

- placement onto clear seabed which avoids pipelines and any other seabed infrastructure, and
- placement to occur within the title boundary.

In accordance with these criteria, WTA, BMA and FTA removed sections were not considered feasible for seabed placement due to insufficient water depth. An indication of the maximum number of removed SPJ sections that are being considered for placement are shown in Figure 4-12. This maximum is calculated based on the height of the structure that is available for placement once the components with the potential to contain contaminants are removed for onshore handling. If this option were to be carried forward, detailed calculations would be required to determine the final number of removed sections that could be placed and this would depend on the feasibility of cutting methods, the method of handling after cutting, placement location and whether removed sections could meet the placement criteria.

The three struts which will be removed from HLA, KFA and KFB are also considered for placement (pending removal of upper sections deemed not feasible for placement due to epoxy coatings or monel wraps as discussed in Section 3), although not shown in Figure 4-12.

Under the placement scenario, up to 18 removed sections from seven SPJs plus the three removed struts may be placed alongside the lower sections of the SPJ's remaining in place. The indicative dimensions for the removed structures are summarised in Table 4-12. Appendix A1 and Appendix A2 provides the details of the property inventory including the breakdown of estimated weights for the proposed SPJ end states.

[4] OAs for the SPJs covered by this EP do not include protected areas or MNES that would preclude placement options.

Table 4-12 Indicative component dimensions and weights for maximum placement options per SPJ

SPJ		Water depth (m)	Maximum number seabed placement	Minimum footprint area (m^2)	Weight of placed sections (MT)		Surface area placement (m^2)
					Steel	Anode	
HLA	Jacket and strut	73.0	7*	9800	2437	-	12500
KFA	Jacket and strut	77.0	4*	8900	1776	-	9300
KFB	Jacket and strut	78.0	4*	6600	1730	-	9100
MKA	Jacket	93	1	2500	365	1	1900
WKF	Jacket	76.0	2	4500	1103	1	5800
CBA	Jacket	78.0	2	4600	1027	1	5400
FLA	Jacket	93.0	1	2600	937	-	4900

Note: * Number of seabed placements for HLA, KFA and KFB includes placement of strut

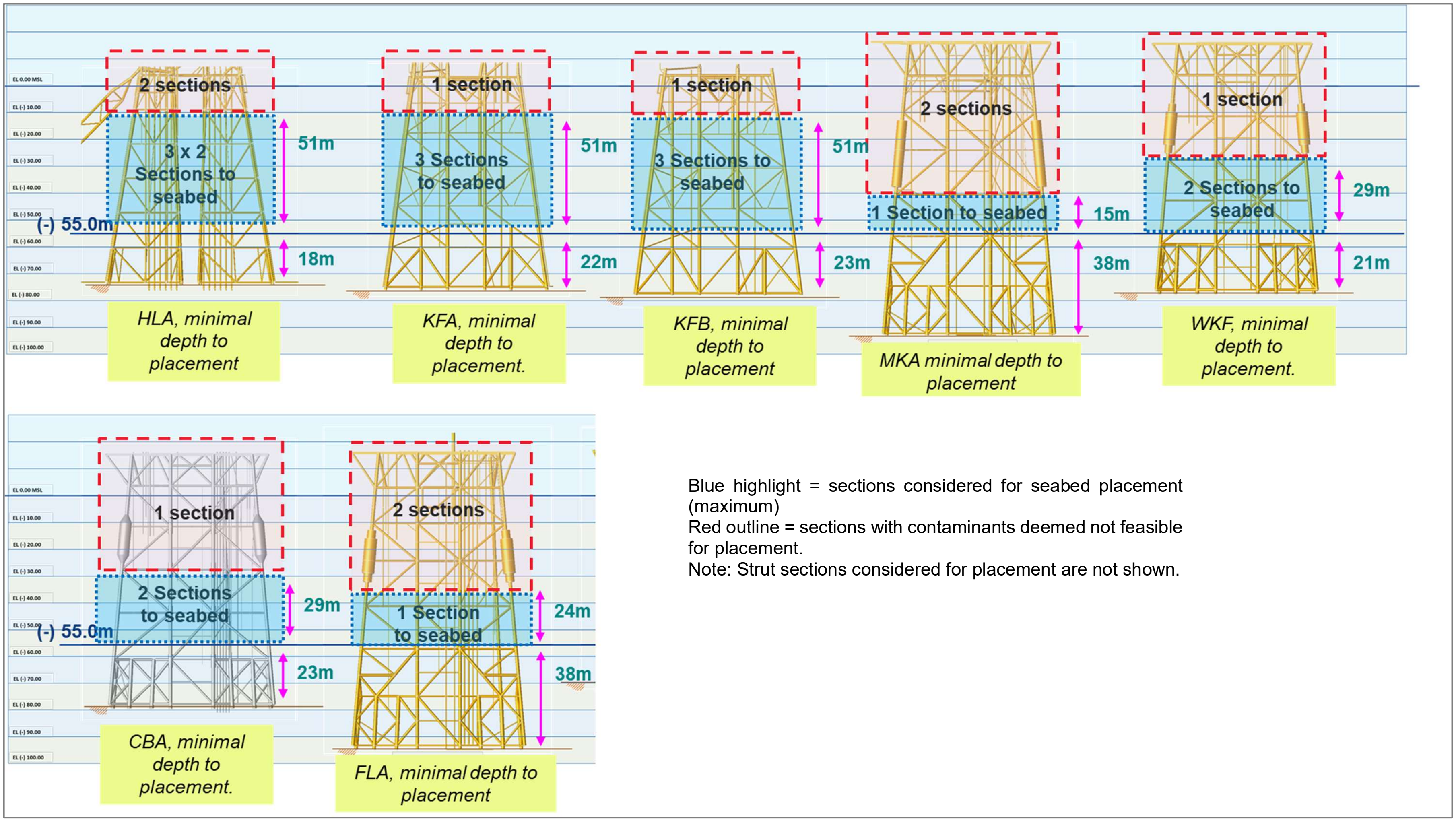


Figure 4-12 Steel Piled Jacket removed sections considered for seabed placement

The exact number of removed sections placed, the placement locations and configurations of the removed sections would be determined at a later date if this option was selected (noting the criteria described above would be met). Figure 4-13 shows indicative placement locations adjacent to the original structure for the three SPJ removed sections and the removed strut using KFA as an example.

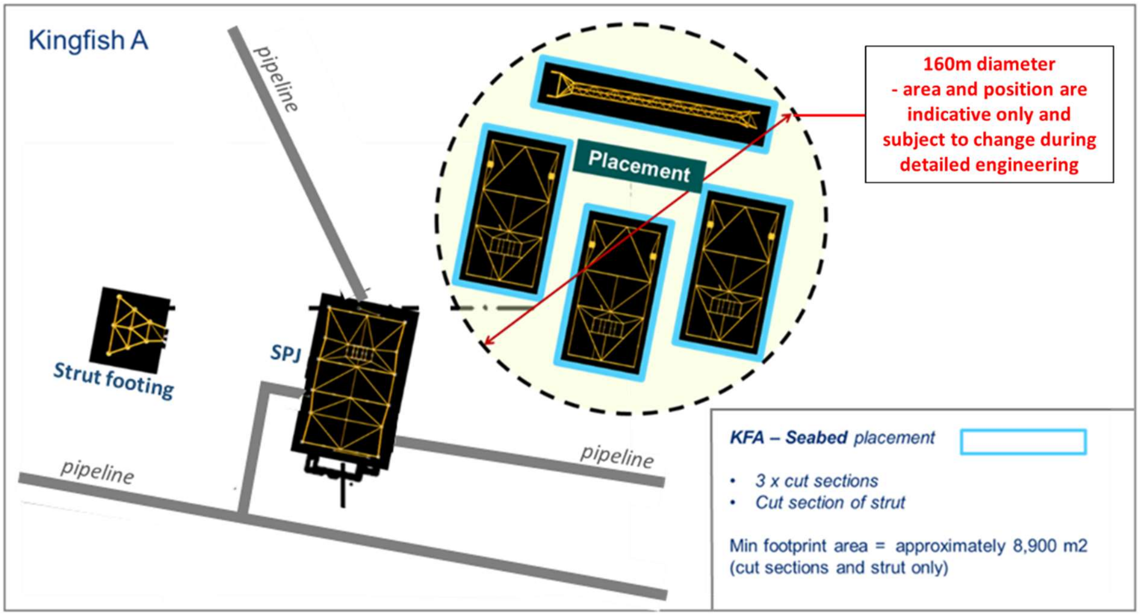


Figure 4-13 Indicative placement positions for Kingfish A cut jackets

4.5.2 Transport onshore

The removed sections of the SPJs that are not feasible for seabed placement (refer to Figure 4-12), will be transported to a suitable onshore location for further processing. The further processing of these sections (and other infrastructure removed from offshore) is an important component of the overall decommissioning project in Bass Strait. Planning is occurring in parallel to identify suitable means and locations for onshore processing to include opportunities for recycling and appropriate disposal where recycling is not possible. The onshore handling and disposal of all SPJ's will be conducted in accordance with applicable laws and standards at the selected onshore location.

5 Description of the environment

5.1 Overview

This description of the environment has been prepared in accordance with the requirements of the OPGGS Act and the OPGGS (Environment) Regulations. The EP development has been guided by *Environment plan content requirements* (NOPSEMA, 2020b).

The description of the environment provided here is for the OAs as defined in Section 4.3 and the surrounding areas to provide context for where the activities are occurring and proximity to particular values and sensitivities as defined by the OPGGS (Environment) Regulations (refer to Table 5-1).

5.2 Regulatory context

The OPGGS (Environment) Regulations have prescribed requirements for the description of the environment. The OPGGS (Environment) Regulations define 'environment' as 'the ecosystems and their constituent parts, natural and physical resources, qualities and characteristics of areas, the heritage value of places and includes the social, economic and cultural features of those matters'. In accordance with Regulation 13(2) of the OPGGS (Environment) Regulations, this document describes the physical setting, ecological receptors, and social receptors, of the receiving environment.

Table 5-1 lists the requirements of the regulations and identifies the sections in this description of the environment where the requirements are addressed.

Table 5-1 OPGGS (Environment) Regulations requirements for the description of the activity with references to where these items are addressed

Regulation	Requirement	Relevant section where this is addressed
13(2)	The Environment Plan must:	
13(2)(a)	• describe the existing environment that may be affected by the activity	Section 5
13(2)(b)	• include details of the particular relevant values and sensitivities (if any) of that environment'	Section 5.4
13(3)	Without limiting paragraph (2)(b), particular relevant values and sensitivities may include any of the following:	
13(3)(a)	• the world heritage values of a declared World Heritage property within the meaning of the EPBC Act	N/A
13(2)(b)	• the national heritage values of a National Heritage place within the meaning of that Act	N/A
13(2)(c)	• the ecological character of a declared Ramsar wetland within the meaning of that Act	Section 5.4.1

Regulation	Requirement	Relevant section where this is addressed
13(2)(d)	• the presence of a listed threatened species or listed threatened ecological community within the meaning of that Act	Section 5.5.1 Section 5.4.2
13(2)(e)	• the presence of a listed migratory species within the meaning of that Act	Section 5.5.1
13(2)(f)	• any values and sensitivities that exist in, or in relation to, part or all of:	
13(2)(f)(i)	○ a Commonwealth marine area within the meaning of that Act; or	Section 5.4.3 Section 5.4.4
13(2)(f)(ii)	○ Commonwealth land within the meaning of that Act	N/A

5.2.1 Environment Policy

It is Esso's policy to conduct its business in a manner that is compatible with the balanced environmental and economic needs of the communities in which it operates. Esso is committed to continuous efforts to improve environmental performance throughout its operations.

Accordingly, Esso's policy is to:

- comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist
- encourage concern and respect for the environment, emphasize every employee's responsibility in environmental performance, and ensure appropriate operating practices and training
- work with government and industry groups to foster timely development of effective environmental laws and regulations based on sound science and considering risks, costs and benefits, including effects on energy and product supply
- manage its business with the goal of preventing incidents and of controlling emissions and wastes to below harmful levels and design, operate, and maintain facilities to this end
- respond quickly and effectively to incidents resulting from its operations, cooperating with industry organizations and authorized government agencies
- conduct and support research to improve understanding of the impact of its business on the environment, to improve methods of environmental protection, and to enhance its capability to make operations and products compatible with the environment
- communicate with the public on environmental matters and share its experience with others to facilitate improvements in industry performance
- undertake appropriate reviews and evaluations of its operations to measure progress and to ensure compliance with this environmental policy.

A copy of the Environment Policy is provided in Appendix B.

5.3 Physical environment

5.3.1 Climate and meteorology

Average summer air temperatures in coastal Victoria (Yarram Airport) range from early morning lows of 11-13 degrees Celsius, to afternoon highs of 23-26 degrees Celsius (BOM, 2017). Average winter temperatures range from minimums of 5 degrees Celsius to maximums of 15 degrees Celsius in the afternoons. Offshore (Deal Island in central Bass Strait), milder conditions occur with an average summer range of 13-21 degrees Celsius and an average winter range of 9-14 degrees Celsius (BOM, 2017).

Average monthly rainfall along the Gippsland coast (Yarram Airport) ranges from 36 millimetres in January (highest 112 millimetres) to 60 millimetres in June (highest 174 millimetres). Offshore (Deal Island in central Bass Strait) monthly rainfall ranges from 41 millimetres in January (highest 162 millimetres) to 78 millimetres in June (highest 247 millimetres) and shows a similar pattern to the coastal region (Lakes Entrance) with slightly higher winter rainfall: 38 millimetres in January (highest 90 millimetres) to 101 millimetres in June (highest 298 millimetres) (BOM, 2017).

Wind speeds are in the range of 10-30 kilometres per hour with maximum gusts reaching 100 kilometres per hour. The wind direction is predominately westerly during winter, westerly and easterly during spring and autumn (when wind speeds are highest) and easterly during summer. Strong south-easterly winds can be generated by low pressure systems known as east coast lows. Although these occur relatively infrequently (once or twice per year), the longer fetch of these winds increases their potential for generating extreme wave conditions (BOM, 2017).

There are three main and one minor type of storm which can generate severe wave conditions in the Bass Strait region. These are (Esso, 1989) (Cardno, 2017):

- Southeast storms: Are generally associated with east coast lows. East coast lows are generally associated with very strong east to southeast winds (speeds in excess of 80 knots have been measured off the New South Wales coastline) and high rainfall. Southeast storms resulting from east coast lows occur relatively infrequently (on average one to two per year), and not all travel far enough south to cause concern in Bass Strait. The waves they generate are however, unrestricted by fetch or water depth. As such they have the greatest potential for generating extreme wave conditions in eastern Bass Strait.
- Southwest storms: Occur relatively frequently (typically several severe storms per year). Due to fetch and depth limitation, it is unlikely that extreme design-wave conditions will occur during a southwest storm.
- South storms: Are generally associated with low-pressure systems in the western part of the Tasman Sea. During the peak of the storm the Tasman Sea lows generate very strong south southeast through to south south-west winds in Bass Strait. During storm development however, the wind can have a significant southeast or southwest component, depending on the origin of the low. Southerly storms occur at about the same frequency as southeast storms. Southerly storms are considered to have a greater potential than the southwest storms for generating extreme wave conditions.
- Small-scale Bass Strait lows: Can generate southeast, south or southwest waves, depending on their origin and location. These storms can be quite severe

(e.g. January 1986 storm), but due to fetch limitations are unlikely to be the cause of extreme design-wave conditions.

5.3.2 Oceanography

5.3.2.1 Currents and tides

Currents in the Gippsland Basin are tide and wind driven. Tidal movements predominantly have a northeast–southwest orientation. Tidal flows come from the east and west during a rising (flood) tide, and flow out to the east and west during a falling (ebb) tide. Tidal streams are dominated by the lunar tidal constituent, which has a period of 12.4 hours. The main tidal components vary in phase by about three to four hours from east to west. Most of this phase change occurs between Lakes Entrance and Wilsons Promontory. Timing of the high tide, for example, can vary by up to three hours across this region. Tides in the area from Lakes Entrance to Gabo Island are, however, relatively weak in comparison to other areas of Bass Strait (Global Environmental Modelling System, 2005).

Bass Strait is characterised by shallow water and tidal currents. While there is a slow easterly flow of waters in Bass Strait, there is also a large anticlockwise circulation. The shallowness of the water means that these waters more rapidly warm in summer and cool in winter than other waters of the region.

Wind driven currents in Gippsland Basin can be caused by the direct influence of weather systems passing over Bass Strait (wind and pressure driven currents) and the indirect effects of weather systems passing over the Great Australian Bight (Global Environmental Modelling System, 2005). Appendix D2 provides the current wind roses from six platforms in Bass Strait (SNA, TNA, FTA, HLA, CBA and MKA) (RPS, 2016). They show the monthly average ocean current rose plot derived from the five-year current dataset at each location.

The colour keys show the current speeds (metres per second), the compass direction provides the current direction flowing towards and the length of the wedge gives the percentage of the record for a particular speed and direction combination.

The eastern parts of the region are strongly influenced by the East Australian Current (EAC) that flows southward adjacent to the east coast of New South Wales, Victoria and Tasmania, carrying warm equatorial waters. Refer to Figure 5-1 and Figure 5-2 (Department of the Environment, 2015a). The EAC is up to 500 metres deep and 100 kilometres wide, and is strongest in summer when it can flow at up to 5 knots. In winter it flows at 2-3 knots as the oceanographic and climatic drivers in the Coral Sea diminish. The EAC tends to form ocean eddies that rotate around warm, central cores that can be up to 200 kilometres across, and may persist for months. Eddies form more frequently off the south coast of New South Wales than other areas, but are also common along the east coast of Tasmania. The eddies can cross the continental shelf, and when mixing with shelf break waters, create upwellings that form isolated areas of enhanced productivity 200-300 kilometres in diameter. Seasonal and transient upwellings are important ecological features of the region. The closest to the Bass Strait operations is the upwelling east of Eden, a KEF for the high productivity and aggregations of marine life (refer Section 5.4.5). The EAC also affects sea surface temperatures on the eastern Tasmanian shelf, which can vary substantially among years depending on the relative influence of subtropical waters.

At the shelf break east of Bass Strait, nutrient-rich waters rise to the surface in winter as part of the processes of the Bass Strait cascade, where the eastward flushing of the shallow waters that are more saline and slightly warmer than surrounding Tasman Sea waters form an undercurrent that cascades down the continental slope. The cascading water has a displacing effect causing nutrient rich waters to rise which in turn leads to increased primary productivity in those areas. The cascading water also concentrates nutrients and some fish and whales are known to aggregate along its leading edge.

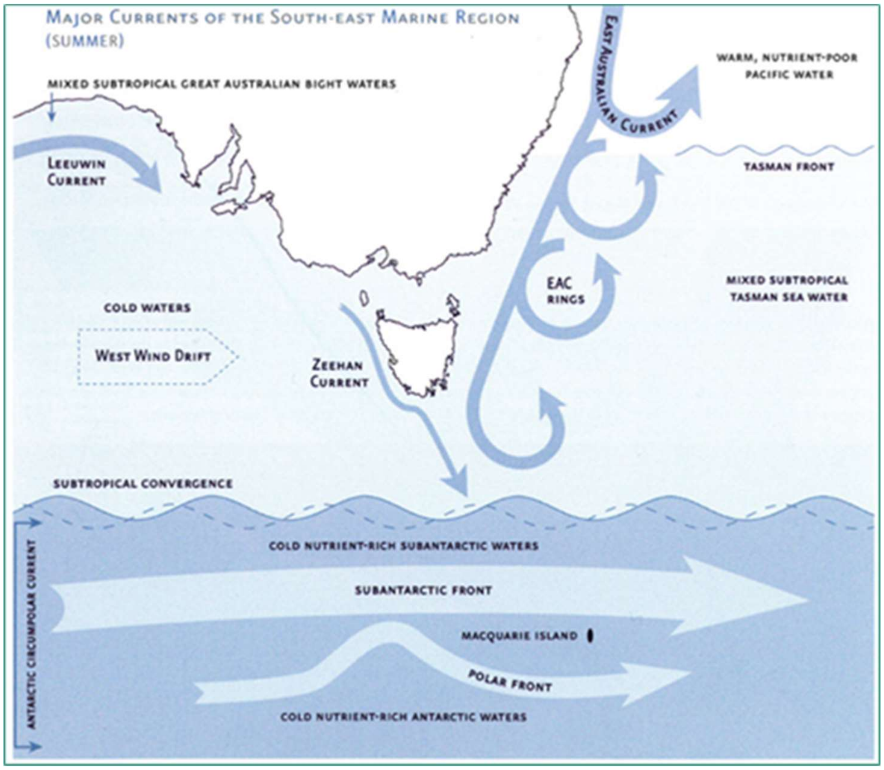


Figure 5-1 Major ocean currents in south-eastern Australian waters summer

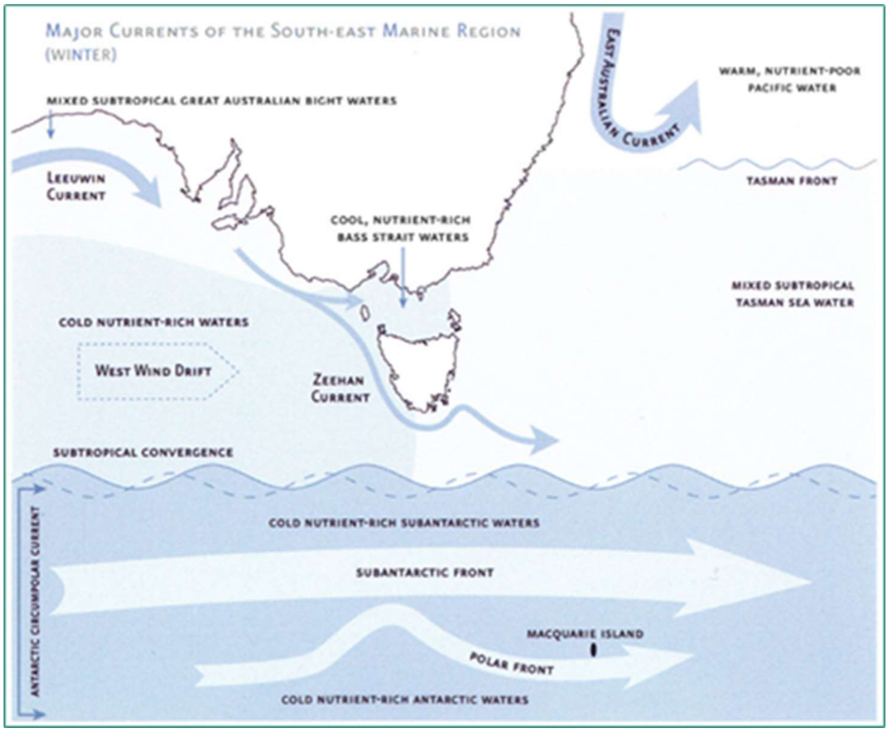


Figure 5-2 Major ocean currents in south-eastern Australian waters winter

Further offshore, in the south-east part of the OAs, currents are driven by two parameters, the sub-Antarctic water movement, coming from the south, and the Bass Strait water movement from the west (Tomczak, 1985) (Gibbs, Arnott, Longmore, & Marchant, 1991). The presence of deepwater currents is documented in the Blackback Oceanographic Study (Lawson and Treloar Pty Ltd, 1996), Kingfish B wave, current and wind data (Lawson and Treloar Pty Ltd, 1998) and Metocean Design Criteria for Bass Strait Fixed Platforms (Esso, 1989).

Esso undertook a comprehensive current measurement program in the Blackback (BKA) subsea facility area using seven current meters moored three metres above the seabed over a 12-month period (Lawson and Treloar Pty Ltd, 1996) to provide an understanding of the regional oceanography of the Bass Strait shelf and continental slope, particularly the relative importance of tidal, wind-driven and density-generated currents and the influence of regional topography on currents in the study area.

Tidal current analysis indicated general seabed current alignment normal to the bathymetry, at speeds of around 0.2-0.3 metres per second. The dominance of the bathymetry was most evident at the current meter sites located within a clearly defined valley.

Analysis of residual, non-tidal current vectors during significant storm periods has confirmed that wind driven currents are the strongest currents in the continental shelf areas but are of progressively lesser significance lower down the continental slope. The study has also provided evidence of flow of water from the continental shelf down the continental slope, conforming to the Bass Strait cascade, as evidenced by high easterly currents and minimum vertical variation in temperature from the shelf to depths of 500 metres (refer to Section 5.4.5). Currents during these cascade flows were stronger than background tidal currents and were the strongest currents recorded lower down the continental slope.

5.3.2.2 Water temperature and density stratification

Temperatures in the subsurface waters of Bass Strait range from about 13 degrees Celsius in August/September to 16 degrees Celsius in February/March. Surface temperatures can exceed 20 degrees Celsius at times in late summer due to the warmer waters of the EAC entering the strait. Water temperatures in the OAs are expected to follow this pattern (Jones I. , 1980). Table 5-2 shows the monthly average sea surface temperatures and salinity as obtained from the World Ocean Atlas 2013 database which shows the same range of temperatures at the BKA wells locations (in deeper water) and the WTA platform (in shallower water) location as those previously recorded, showing temperatures across Bass Strait do not vary significantly. Monthly average sea surface temperatures were shown to range from 14 degrees Celsius in August/September to 21 degrees Celsius in March. Salinity remained consistent throughout the year ranging from 35-36 practical salinity unit (RPS, 2018) (RPS, 2019).

Waters are generally well mixed, but surface warming sometimes causes weak stratification in calm summer conditions. During these times, mixing and interaction between varying water masses leads to variations in horizontal water temperature and a thermocline (temperature profile) develops. The thermocline acts as a low friction layer separating the wind driven motions of the upper well mixed layer from the bottom well mixed layer. As a result, upwelling of cold water on the northern shores of Bass Strait can occur (Jones I. , 1980).

Table 5-2 Average monthly sea surface temperature and salinity nearby Blackback within the 0-5 metres water depth and the Whiting platform location

Blackback	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	19	20	20	19	18	16	15	15	14	15	16	18
Salinity (psu)	35	35	36	36	35	36	36	36	35	36	36	36
WTA	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Temperature (°C)	19	20	21	19	17	16	14	14	14	15	16	17
Salinity (psu)	35	35	36	36	35	36	35	36	35	35	35	35

Information on density and temperature profiles of the deeper area of the BKA field has been obtained by (Lawson and Treloar Pty Ltd, 1996). Temperatures measured at the seabed confirmed a decrease in temperature with depth of measurement. The survey also showed a period (July to September) of uniformity of temperature at all measured depths, indicating flow down the continental slope (Bass Strait cascade). The range of water temperatures observed at the seabed is from a maximum of 17 degrees Celsius at 93 metres to a minimum of 7 degrees Celsius at 480 metres. The minimum temperatures at depth were recorded in summer, possibly because of stronger stabilising stratification and absence of the cascade of relatively warmer water during winter.

5.3.2.3 Waves

Bass Strait is a high energy environment exposed to frequent storms and significant wave heights. High wave conditions are generally associated with strong west to south-west winds caused by the eastward passage of low-pressure systems across Bass Strait (Jones I. , 1980).

Extreme design wave conditions are associated with east coast low-pressure systems. These can result in very strong east to southeast winds in eastern Bass Strait. *Metocean Design Criteria for Bass Strait fixed platforms* (Esso, 1989) gives a design significant wave height of 9 metres and a corresponding maximum wave height of 17.5 metres.

Wave data from the KFB weather station were analysed for the ten-year period from 1990-2000 (O'Grady & McInnes, 2010). Average significant wave heights at KFB were 1.97 metres, approximately 40 percent lower than those to the west of Bass Strait (Cape de Couedic and Cape Sorell) and approximately 10 percent higher than on the east coast at Eden. The highest significant wave height recorded was 4.79 metres. Wave periods at KFB are also lower by just over thirty percent compared to those to the west of Bass Strait and are about ten percent lower than those at Eden. These differences are a result of the fetch-limited conditions that exist in Bass Strait where a portion of the long period waves from the southern ocean are blocked by Tasmania. Table 5-3 shows the monthly mean, significant wa^{ve} height and 99th percentile values recorded at KFB for the period of 1990-2000 (O'Grady & McInnes, 2010).

The analysis of the data showed that for waves at KFB, the highest wave events occur most frequently with westerly wind events and were usually associated with storm surge events (occurring 58 percent of the time) in north-eastern Bass Strait. However, high wave events can also occur during easterly wind events when a weak or a negative surge from the south-east is present (occurring 31 percent of the time) (O'Grady & McInnes, 2010).

Table 5-3 Kingfish B wave data

Month	Mean Wave height (m)	Wave height standard deviatio^{n}	Wave height 99th percentile (m)	Peak wave period (sec)	Peak wave period standard deviation	Pea^{k} wave period 99th percentile (sec)	Number of observation s
Jan	1.64	0.67	3.58	7.83	1.75	13.27	4832
Feb	1.69	0.75	4.09	8.14	2.11	14.17	4063
Mar	1.62	0.77	4.24	8.32	2.18	13.74	4615
Apr	1.66	0.84	4.13	8.43	2.12	13.61	4295
May	1.45	0.73	3.92	8.69	2.5	15.06	4842
Jun	1.71	0.87	4.21	8.8	2.48	14.53	5129
Jul	1.74	0.83	4.3	9	2.51	15.05	5509
Aug	1.7	0.83	4.12	8.66	2.57	15.34	5120
Sep	1.8	0.93	4.48	8.6	2.21	13.97	5157
Oct	1.59	0.79	4	8.37	2.21	14.74	4955
Nov	1.78	0.92	4.79	7.76	1.83	12.71	4346
Dec	1.66	0.79	3.91	7.96	1.92	13.12	5395
Mean	1.67	0.81	4.15	8.38	2.2	14.11	4855
SD	0.09		0.29	0.38		0.81	431

5.3.2.4 bathymetry

The OAs are located in Bass Strait, the region of the continental shelf that separates mainland Australia from Tasmania. The bathymetry around the OAs is concave shaped, with a shallower rim on the eastern and western end, and a deeper centre. The seabed bathymetry across the region is highly variable. A steep nearshore profile (0 to 20 metres water depth) extends to a less steep inner (20 to 60 metres water depth) and moderate profile (60 to 120 metres water depth), concluding with a flat outer shelf plain (greater than 120 metres water depth) in the western part (central Bass Strait) and a steep slope into the Bass Canyon in the east. The OAs for each SPJ are distributed across Bass Strait from the WTA platform located closest to the coast at approximately 34 kilometres and in approximately 54 metres water depth out to the FLA platform area that extends out to 58 kilometres offshore in water depths of approximately 93 metres. Refer to Figure 4-1, which shows the bathymetry in Bass Strait.

5.3.3 Sediment characterisation

5.3.3.1 Grain size

The Gippsland Basin is composed of a series of massive sediment flats, interspersed with small patches of reef, bedrock and consolidated sediment. The sandy plains are only occasionally broken by low ribbons of reef; however, these reefs do not support the large brown seaweeds characteristic of many Victorian reefs, but instead are inhabited by resilient red seaweeds and encrusting animals that can survive the sandy environment (Esso, 2009). In the Gippsland Basin, seabed material is predominantly calcium carbonate comprised of calcarenite marls and marine shales (Esso, 2009). A study of the seascape of the south-eastern Australian continental shelf conducted in 2001 found that 89 percent of the seabed was sediment flats/bare substrate with prominent hard grounds making up the remaining 11 percent of the seabed (Bax & Williams, 2001).

Grain size is one of the factors which is considered to contribute to presence/abundance of benthic fauna. Past surveys to assess the sedimentology of Bass Strait have characterised the mean grain size distribution, and mapped the majority of Esso's infrastructure as being located in areas with grain size of 0.25-0.50 millimetres (Passlow, O'Hara, Daniell, Beaman, & Twyford, 2006). The exception to these are the BMA facility, which is located on coarser material with a grain size of 0.5-1 millimetres as shown in Figure 5-3).

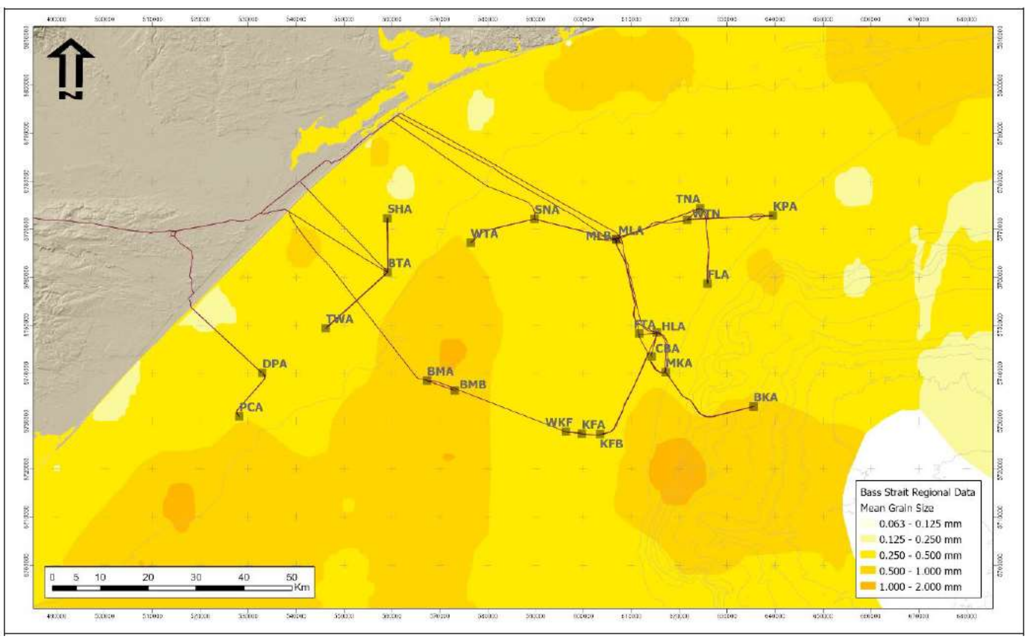


Figure 5-3 Mean sediment grain size class in Bass Strait overlaid with Esso infrastructure

Environmental Survey 1 (Summer), conducted by Esso in 2021, analysed the composition of seabed sediments of five of the OAs covered by this EP, as well as areas around three other Esso facilities that are not included in this EP (Bream B (BMB), BTA and DPA) and in reference sites. The areas surveyed showed a relatively uniform sediment grain size. In all locations the predominant sediment grain size was sand (0.063-2.0 millimetres in diameter), with comparatively minor contributions (<15 percent) from clay- and silt-sized particles at all sites. Gravel-sized particles exceeded 20 percent at two platforms (WTA and BMB) (Hook S. E., et al., 2021). The size distribution did not change considerably across the Basin area or appreciably with depth. Figure 5-4 shows the sediment class distribution across the areas surveyed (Hook S. E., et al., 2021).

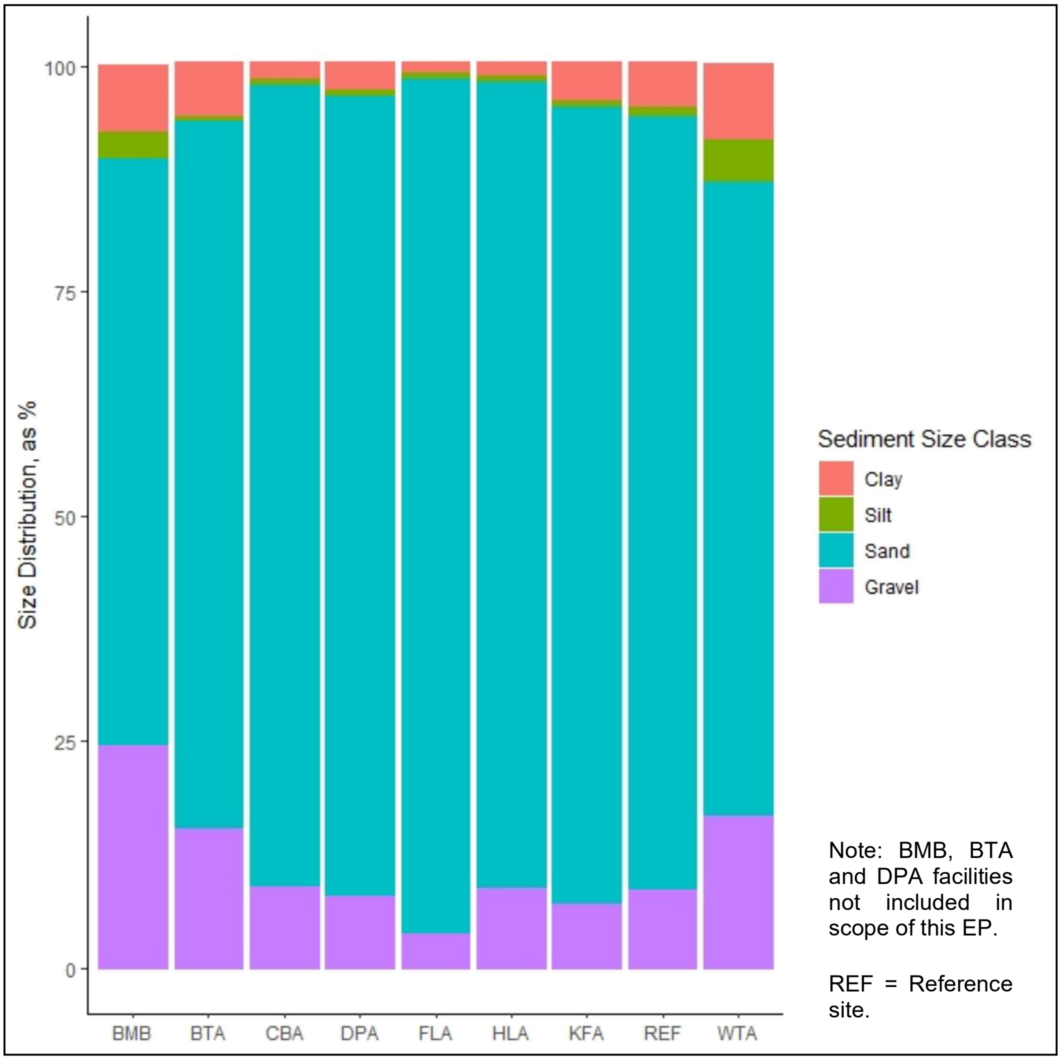
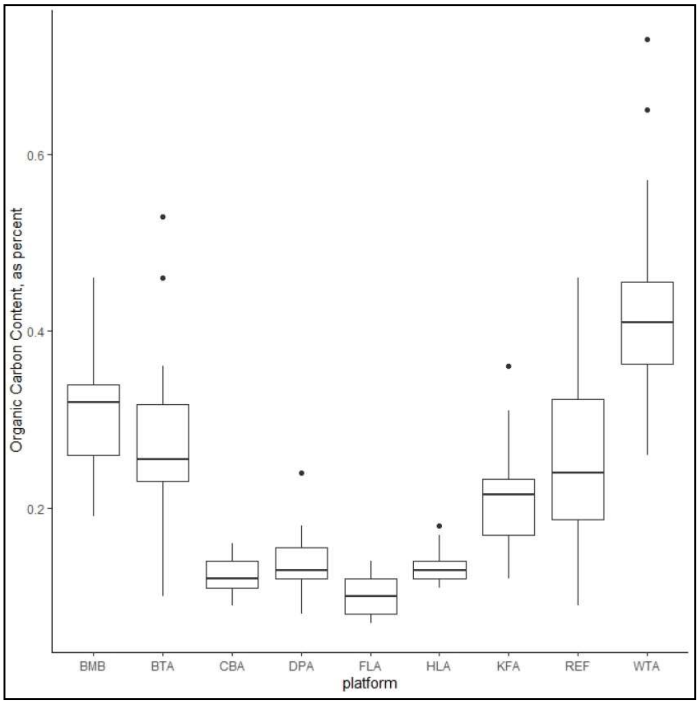


Figure 5-4 Sediment size class distributions at each Operational Area and in the reference sites from Environmental Survey 1 (Summer)

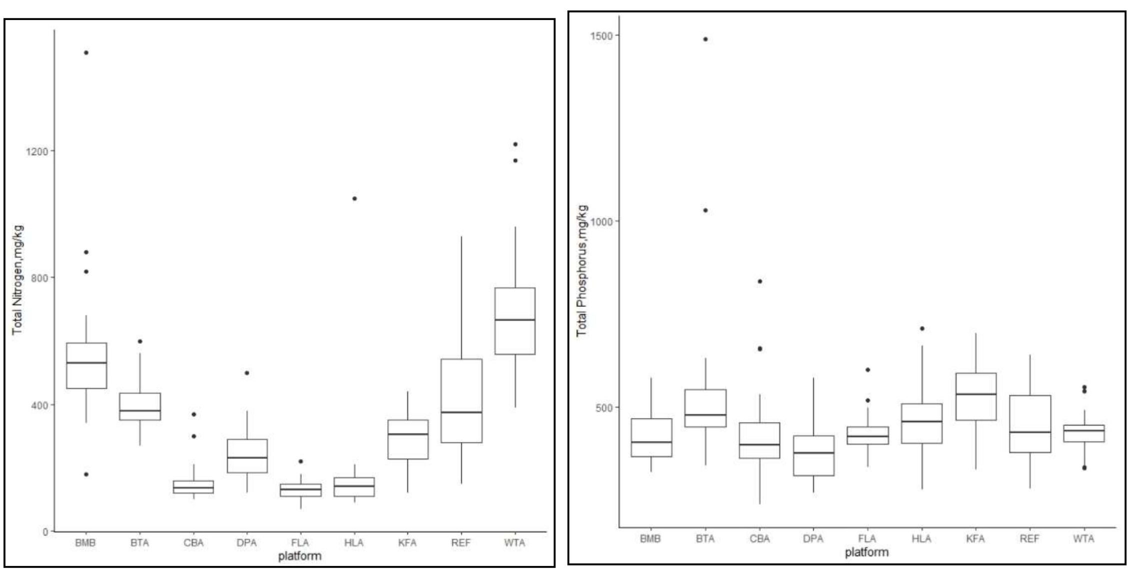
5.3.3.2 Nutrients

As a consequence of the high percentage of sand, the organic carbon content was low, as shown in Figure 5-5 (Hook S. E., et al., 2021). The median value of organic carbon was below 0.5 percent at all platforms and reference areas. The sediments showed some variation in total nitrogen content between platforms, with median sediment concentrations ranging from approximately 200 milligrams per kilogram to approximately 600 milligrams per kilogram nitrogen. By comparison, phosphorus did not vary appreciably at different platforms and had a median concentration between 400-500 milligrams per kilogram , as shown in Figure 5-6 (Hook S. E., et al., 2021). In looking at the concentrations of nutrients in the reference sites alone, there was no clear trend in the concentration of total nitrogen or total phosphorous across the field, with median concentrations of 375 and 433 milligrams per kilogram for each, respectively (AECOM Australia Pty Ltd, 2021).



The median is the centre of the box, the edges of the box show the 25th and 75th percentile distribution, the whiskers show the 10th and 90th percentiles, and the dots are outliers. BMB, BTA and DPA platforms not included in scope of this EP.

Figure 5-5 Distribution of organic carbon content (as percent of total sample) in samples collected from the Environmental Survey 1 (Summer)



The median is the centre of the box, the edges of the box show the 25th and 75th percentile distribution, the whiskers show the 10th and 90th percentiles, and the dots are outliers. BMB, BTA and DPA platforms not included in scope of this EP.

Figure 5-6 Total nitrogen (left) and phosphorus (right) concentration (as milligrams per kilogram) in sediment samples collected from the Environmental Survey 1 (Summer)

5.3.3.3 Metals and hydrocarbon concentrations

The Environmental Survey 1 (Summer) also analysed the metal and hydrocarbon concentrations of sediments at platforms and at reference locations (refer to Section 5.3.3.1). All platforms surveyed except for BMB, BTA and DPA are covered by the activities of this EP. The survey was specifically designed using spatially balanced design criteria, with the view that the results would be representative of contamination levels at the remaining SPJs covered by this EP. Unfortunately, despite the expectation, the results did not provide the logical correlations needed to extrapolate the results to the remaining SPJs. As such, further sediment sampling is planned during Environmental Survey 2 (Winter) to analyse sediments around BMA, KFB, WKF, FTA and MKA. Refer to Section 8.4.6.4 for further information.

Sediment concentrations from the Environmental Survey 1 (Summer) were compared to screening levels which consider toxicological impacts based on regulatory accepted levels, and in some cases more conservative threshold values documented in literature at which there is potential for contamination of seafood resources or in the case of total polyaromatic hydrocarbons (TPAH), have the potential for adverse outcomes to benthic community structure. The screening levels are provided in Appendix F1.

Figure 5-7 to Figure 5-12 show the sampling locations around the platforms and indicate where threshold levels were exceeded for any metal, TPAH or NORM. More than 95% of sampled sites returned concentrations that were below the regulatory or more conservative threshold. The CBA platform is not shown as there were no threshold exceedances recorded in any samples. DPA platform is also excluded as only arsenic exceeded the threshold level and this was assessed to be naturally occurring (explained further below).

The range of measured concentrations of metals at each of the platforms surveyed including reference locations are shown in Figure 5-13 (Hook S. E., et al., 2021). The figure shows two screening levels for each metal. The dashed line corresponds to the ‘effects possible’ range and the solid line corresponds to the ‘effects likely’ range. Although measured metals concentrations in samples collected from the areas around platforms were higher than those measured in reference sites, measured concentrations only occasionally exceeded screening levels, with some exceptions. Only zinc concentrations at BMB and cadmium concentrations at BTA exceeded ’effects probable’ screening levels (both of these platforms are outside the scope of this EP). The vast majority of the exceedances measured were below the lower screening levels, including for all OAs covered in this EP. Where concentrations above screening levels were noted for some analytes, they sometimes occurred within the same grab samples and were grouped around the same platforms, namely BMB, BTA and HLA (Hook S. E., et al., 2021).

Arsenic is not included in Figure 5-13 as its distribution around the platforms and in reference sites did not follow the same patterns of the other metals. Arsenic concentrations exceeded ’effects possible’ concentrations in the majority of sediment samples collected around the DPA platform, as well as some of those from nearby reference sites. Figure 5-16 (Hook S. E., et al., 2021). There is also no relationship between arsenic concentration and distance to platform, which might be expected if the platform (or activity at the platform) was the source of the elevated concentrations (Hook S. E., et al., 2021). This, together with the elevated concentrations of arsenic at reference sites are factors which indicate that the elevated concentrations of arsenic around the DPA platform are naturally occurring. While DPA is not in the scope of this EP, it provides information about characteristics of sediments in the areas around the OAs covered in this EP and also the need to measure and compare results to reference sites.

Figure 5-14 shows the range of measured concentrations of PAHs at the facilities surveyed, including reference locations (Hook S. E., et al., 2021). Elevations in sediment PAH concentration were found predominantly in the low molecular weight PAH, therefore only those compounds with four or fewer aromatic rings are plotted. In most instances, the PAHs were below detection at the platforms, and although measured concentrations of several PAH exceed the lower, 'effects possible' screening levels, they did not exceed the 'effects probable' thresholds. Measurable concentrations of PAH were most common for phenanthrene and naphthalene (Figure 5-14 panel G and F respectively). Some of the samples at BTA, WTA and BMB that exceeded the lower screening levels did so for multiple PAHs and were grouped in the same area within 500 metres of the platform. Figure 5-15 shows summed values of the low molecular weight PAH for each facility. Of the facilities that are in scope for this EP, only WTA shows summed PAH levels exceeding the lower, 'effects possible' screening level.

The full set of results for the sediment sampling, including characterisation are provided in Appendix F2.

Lead	30 mg/kg-1 regulatory	4 mg/kg-1 Literature
BMB18	44.3	-
BMB31B	46.8	-

TPAH	4 mg/kg-1 regulatory OC adjusted	0.1 mg/kg-1 literature OC adjusted
BMB1	-	0.787
BMB5	4.066	-
BMB20	-	0.113
BMB22	-	0.242
BMB23	-	0.128
BMB25	-	0.119
BMB31B	-	0.135
BMB33	-	0.358

Zinc	200 mg/kg-1 regulatory	N/A lit
BMB18	471	-
BMB31B	343	-

Copper	34 mg/kg-1 regulatory	N/A lit
BMB18	56.7	-
BMB31B	58.6	-

Arsenic	20 mg/kg-1 Regulatory	N/A lit
BMB18	20.2	-

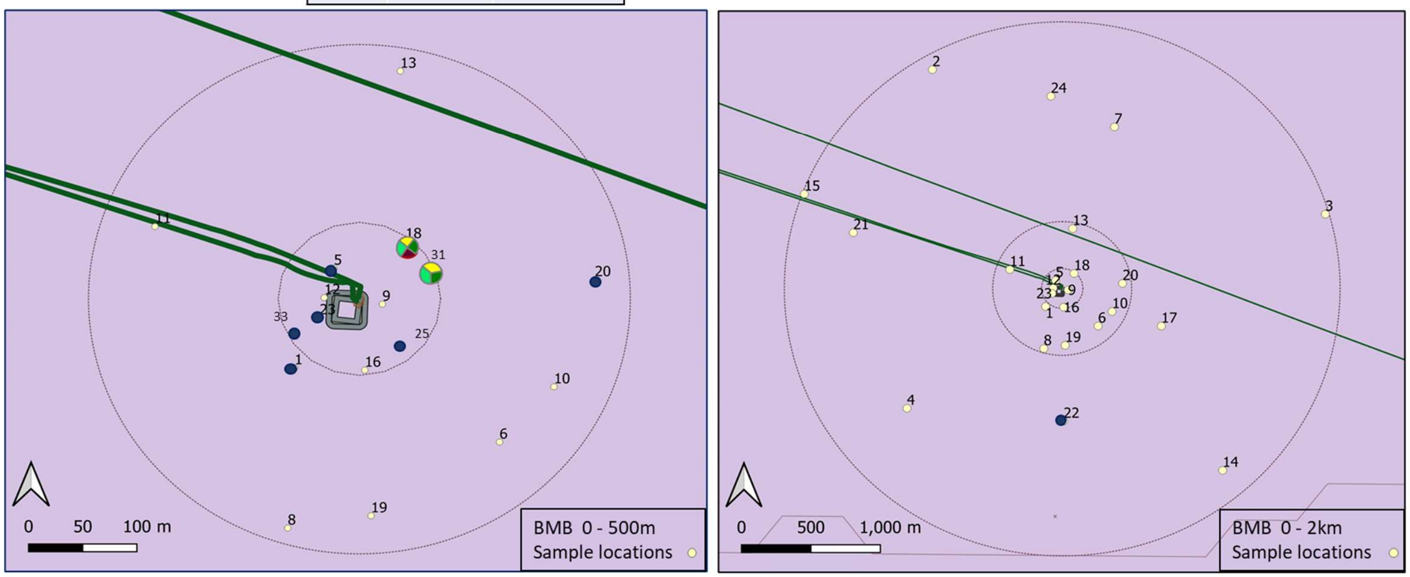


Figure 5-7 Sediment sampling locations around BMB platform.

The tables show regulatory threshold levels and the lower literature threshold value, Analyte concentrations at specific sampled sites are shown where results exceeded the threshold criteria. Coloured dots align with the sample locations which showed exceedances per the tables above. Coloured pie charts show locations where more than one analyte exceeded thresholds.

Lead	30 mg/kg^{-1} regulatory	4 mg/kg^{-1} Literature
BTA16	-	5.4
BTA23	-	10.5

TPAH	4 mg/kg^{-1} regulatory	0.1 mg/kg^{-1} literature OC adjusted
BTA1	-	0.898
BTA3	-	0.508
BTA15	-	1.190
BTA16	-	0.579
BTA21	-	0.393
BTA23	-	0.923

Cadmium	1.5 mg/kg^{-1} regulatory	N/A lit
BTA16	5.4	-

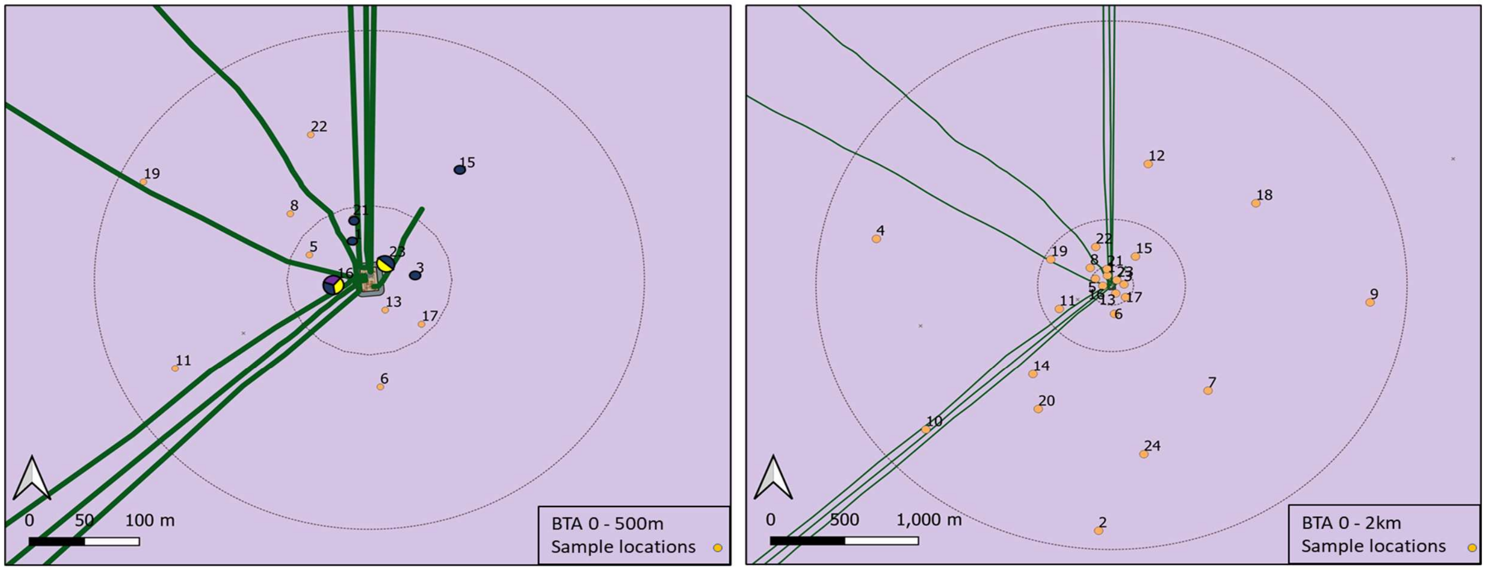


Figure 5-8 Sediment sampling locations around BTA platform.

The tables show regulatory threshold levels and the lower literature threshold value, Analyte concentrations at specific sampled sites are shown where results exceeded the threshold criteria. Coloured dots align with the sample locations which showed exceedances per the tables above. Coloured pie charts show locations where more than one analyte exceeded thresholds.

NORM	1000 Bq/kg DW Gross alpha	1000 Bq/kg DW Gross beta
FLA24	1320	-
FLA26	1690	-

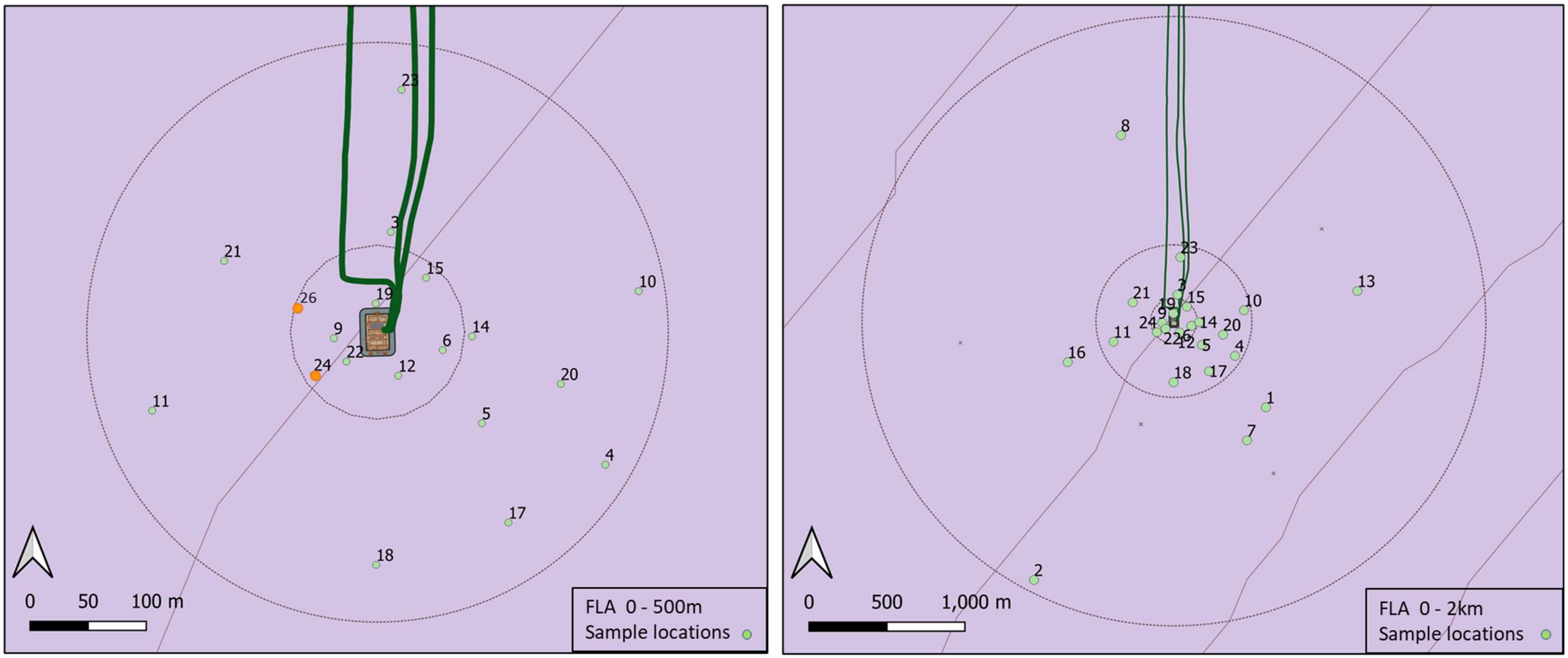


Figure 5-9 Sediment sampling locations around FLA platform.

The tables show regulatory threshold levels, Analyte concentrations at specific sampled sites are shown where results exceeded the threshold criteria. Coloured dots align with the sample locations which showed exceedances per the table above.

Lead	30 mg/kg regulatory	4 mg/kg literature
HLA2	-	4.5
HLA5	-	9
HLA15	-	4
HLA20	-	13.1

Mercury	0.15 mg/kg regulatory	0.05 mg/kg literature
HLA16	-	0.08

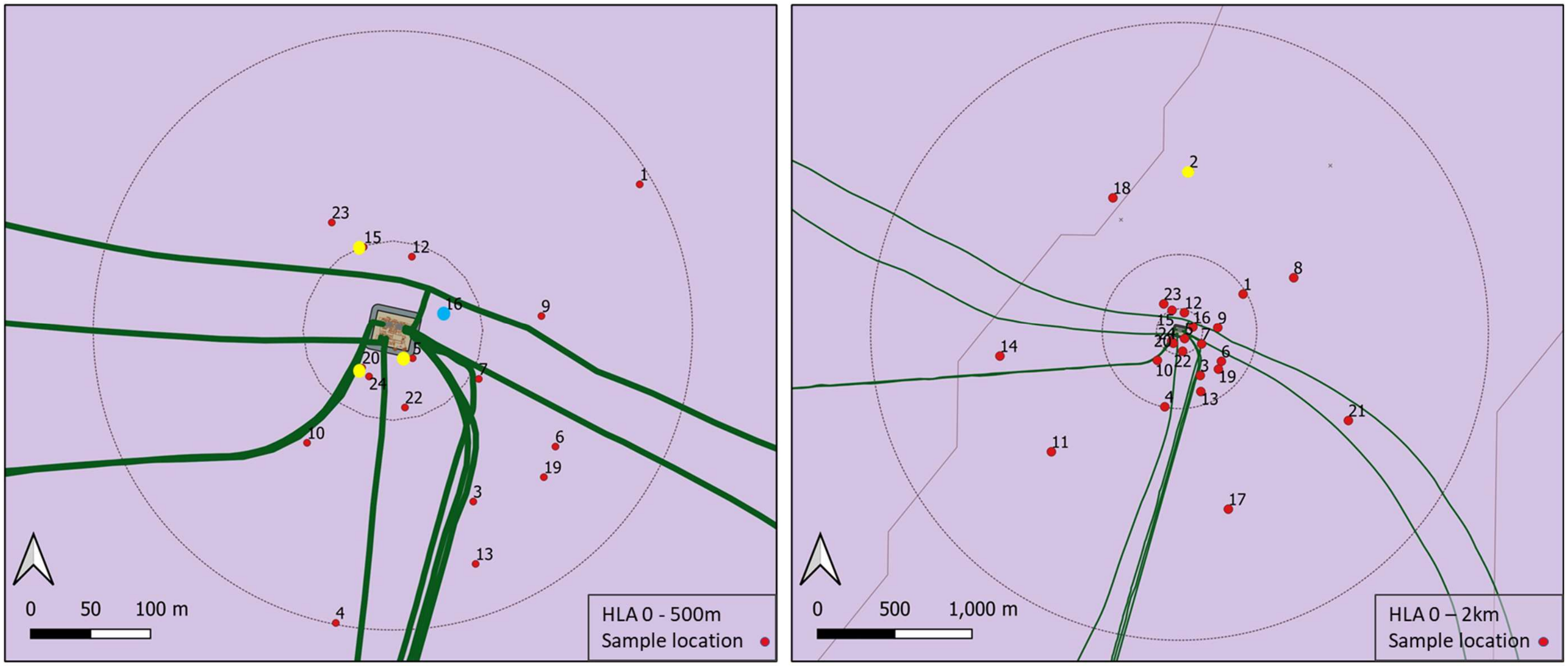


Figure 5-10 Sediment sampling locations around HLA platform.

The tables show regulatory threshold levels and the lower literature threshold value. Analyte concentrations at specific sampled sites are shown where results exceeded the threshold criteria. Coloured dots align with the sample locations which showed exceedances per the tables above.

Lead	30 mg/kg-1 regulatory	4 mg/kg-1 literature
KFA9	-	7

Zinc	200 mg/kg-1 regulatory	N/A lit
KFA12	256	N/A

NORM	1000 Bq/kg DW Gross alpha	1000 Bq/kg DW Gross beta
KFA3	1390	-

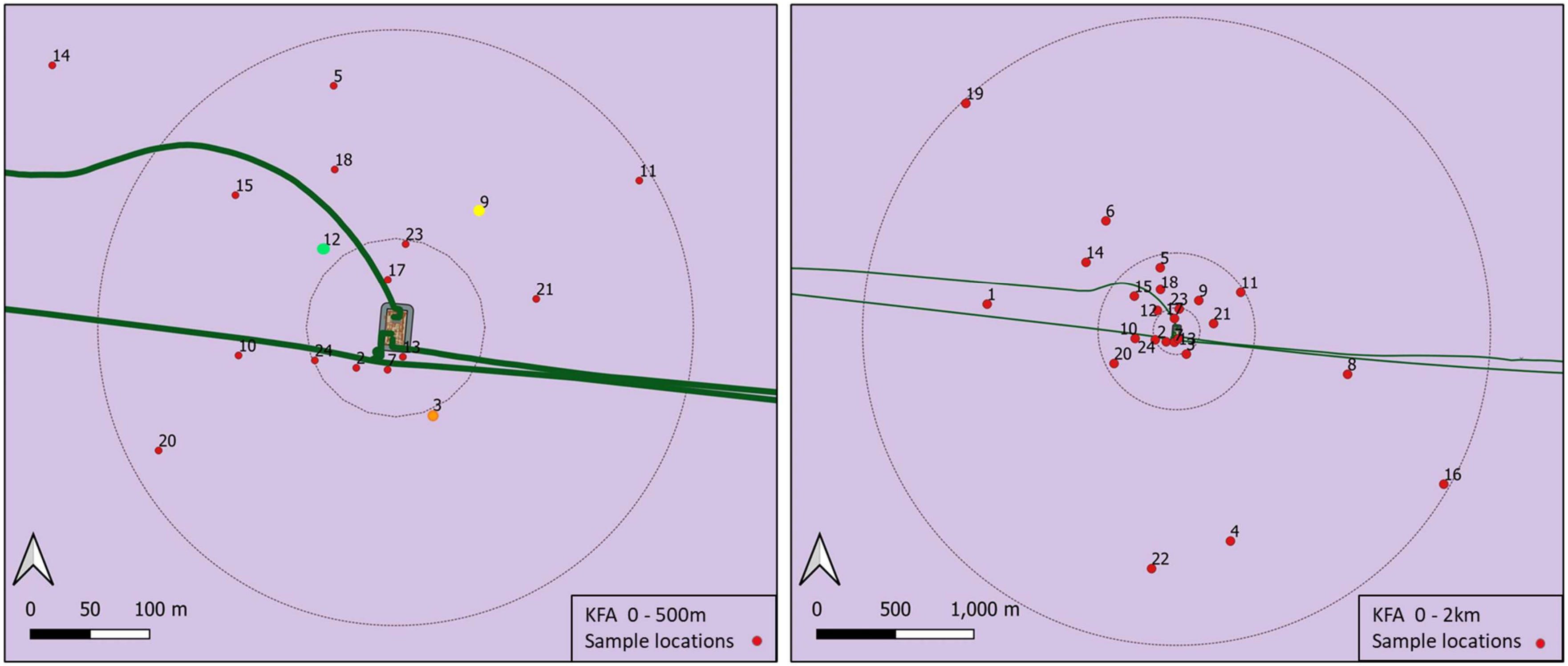


Figure 5-11 Sediment sampling locations around KFA platform.

The tables show regulatory threshold levels and the lower literature threshold value, Analyte concentrations at specific sampled sites are shown where results exceeded the threshold criteria. Coloured dots align with the sample locations which showed exceedances per the tables above.

TPAH	4 mg/kg-1 regulatory	0.1 mg/kg-1 literature OC adjusted
WTA13	-	0.890
WTA21	-	0.269

NORM	1000 Bq/kg DW Gross alpha	1000 Bq/kg DW Gross beta
WTA11	1440	-
WTA16	1320	-

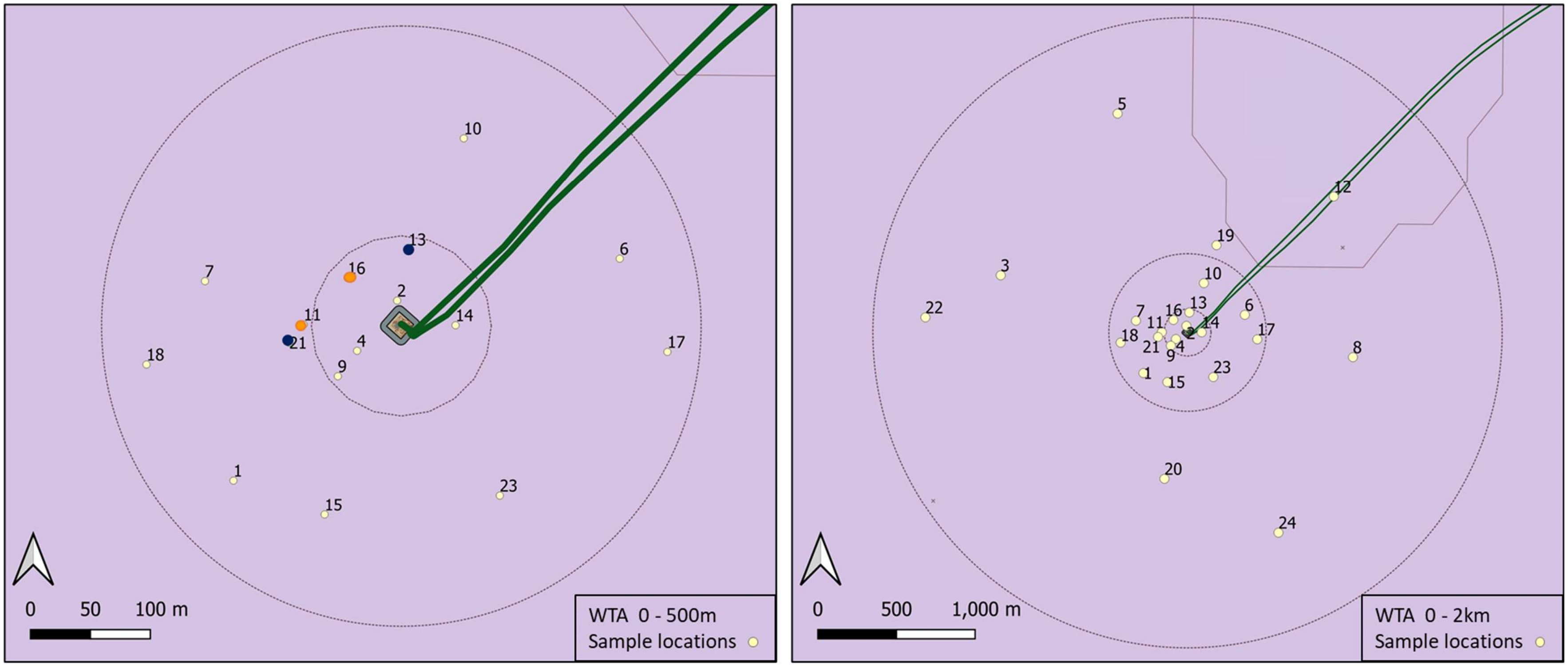
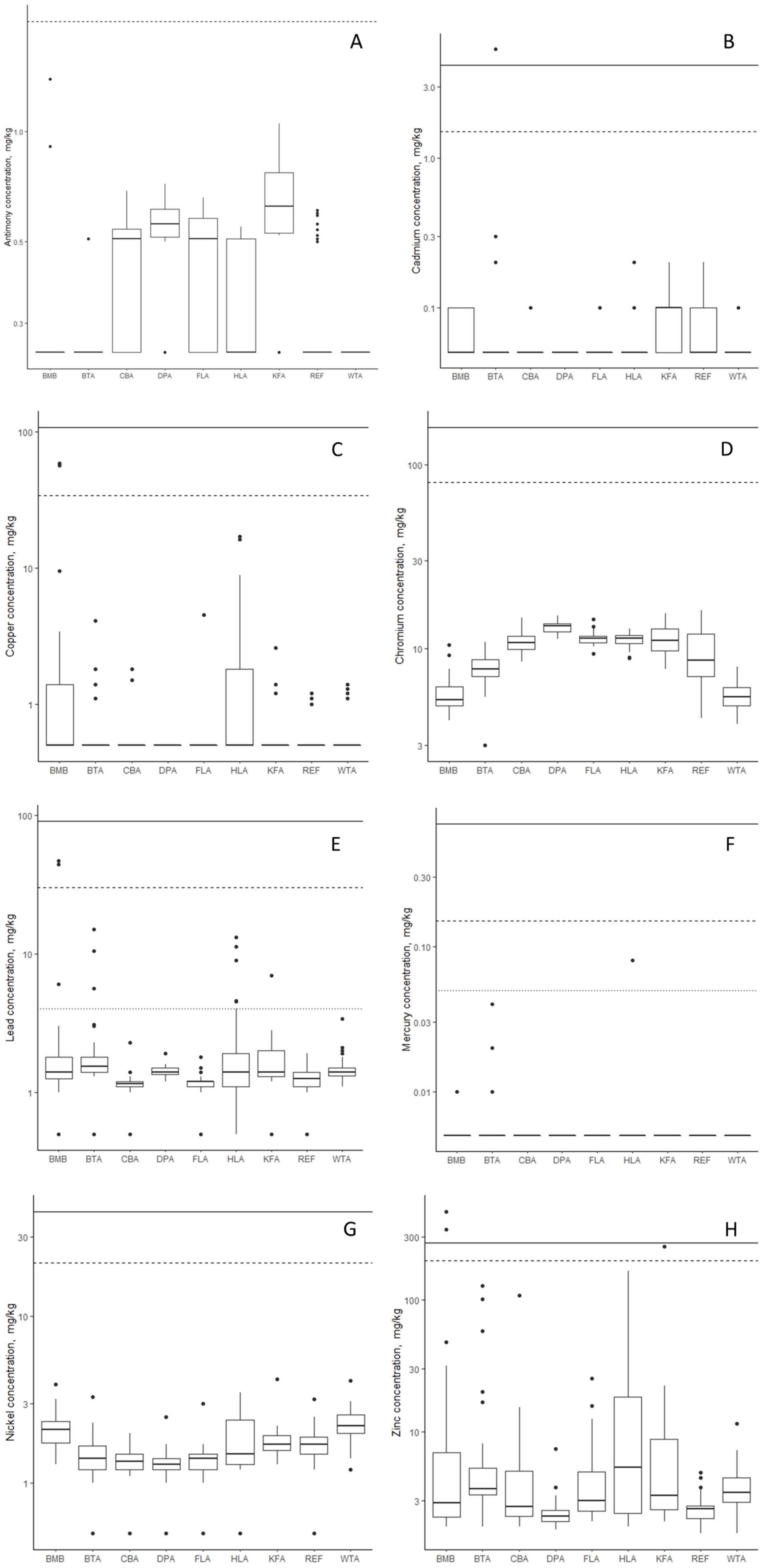


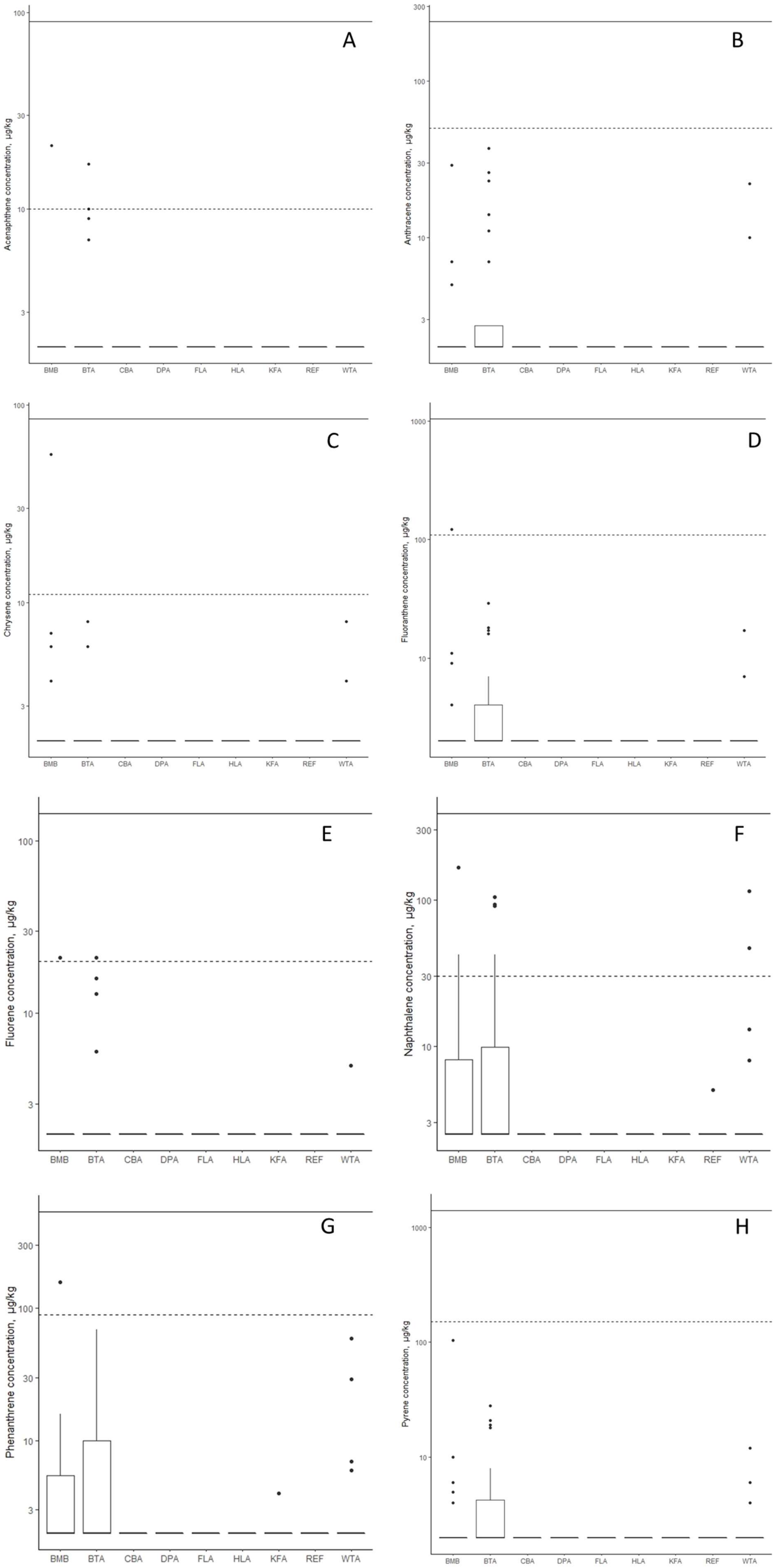
Figure 5-12 Sediment sampling locations around WTA platform.

The tables show regulatory threshold levels and the lower literature threshold value. Analyte concentrations at specific sampled sites are shown where results exceeded the threshold criteria. Coloured dots align with the sample locations which showed exceedances per the tables above.



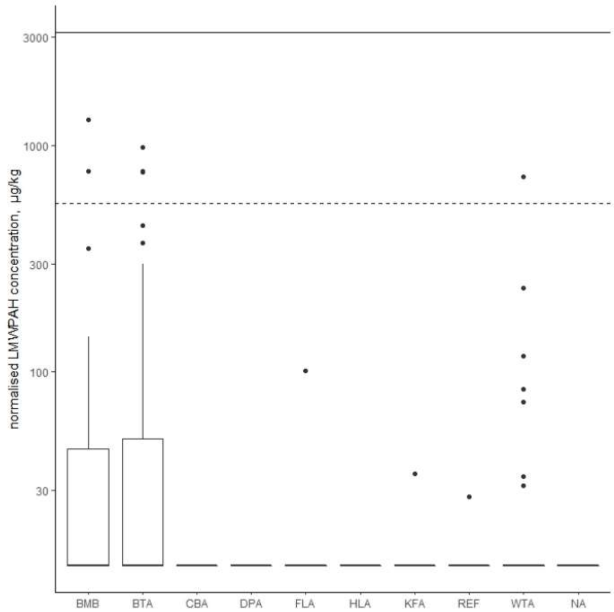
The median is the centre of the box, the edges of the box show the 25th and 75th percentile distribution, the whiskers show the 10th and 90th percentiles, and the dots are outliers. The dashed line shows the 'levels of concern screening values', as defined in Hook S. E., et al. (2021), and the solid line shows the 'effects probable' level (values taken from NOAA per Hook S. E., et al. (2021)). Panel A shows antimony concentrations; B shows cadmium; C shows copper; D shows chromium; E shows lead; F shows mercury; G shows nickel; and H shows zinc. BMB, BTA and DPA facilities are not included in scope of this EP.

Figure 5-13 Range of metal concentrations measured at platforms and reference sites during Environmental Survey 1 (Summer)



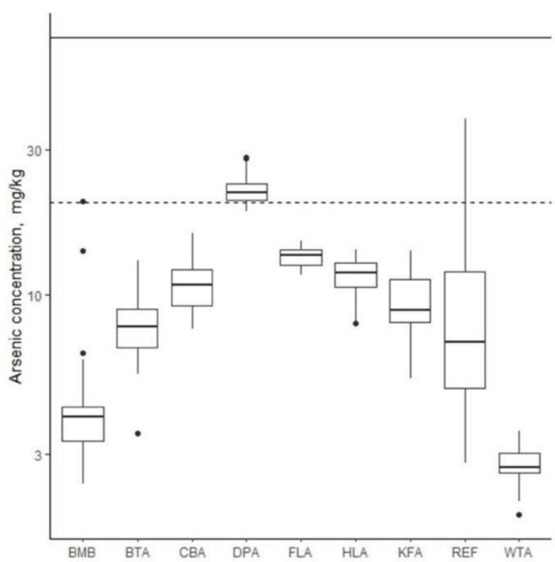
The median is the centre of the box, the edges of the box show the 25th and 75th percentile distribution, the whiskers show the 10th and 90th percentiles, and the dots are outliers. The dashed lines show the Interim Sediment Quality Guidelines – low level, which are comparable to 'effects range-low'. The solid lines show the Interim Sediment Quality Guidelines – high level, which are comparable to 'effects range-medium' (values defined in Hook S. E., et al. (2021)). Panel A shows acenaphthene concentrations; B shows anthracene; C shows chrysene; D shows fluoranthene; E shows fluorene; F shows naphthalene; G shows phenanthrene; and H shows pyrene. BMB, BTA and DPA facilities not included in scope of this EP.

Figure 5-14 Range of polycyclic aromatic hydrocarbons concentrations measured at platforms and reference sites during Environmental Survey 1 (Summer)



The median is the centre of the box, the edges of the box show the 25th and 75th percentile distribution, the whiskers show 10 and 90th percentiles, and the dots are outliers. The dotted line shows the ISGG – low level (which are comparable to ERL) whereas the solid line shows the ISQG-High level (which are comparable to ERM) (values taken from ANZECC 2018), per Hook S. E., et al. (2021)). BMB, BTA and DPA facilities not included in scope of this EP.

Figure 5-15 The range in total low molecular weight (LMW) PAH concentrations, here defined as those with two or three rings) measured at each platform, including reference areas



The median is the centre of the box, the edges of the box show the 25th and 75th percentile distribution, the whiskers show the 10th and 90th percentiles, and the dots are outliers. The dashed line shows the 'levels of concern screening values' as defined in Hook S. E., et al. (2021) and the solid line shows the 'effects probable' level (values taken from NOAA per Hook S. E., et al. (2021)). BMB, BTA and DPA facilities not included in scope of this EP.

Figure 5-16 Range of arsenic concentrations measured at platforms and reference sites during Environmental Survey 1 (Summer)

5.4 Values and sensitivities

This Section summarises the relevant values and sensitivities in and around the OAs as required by Regulation 13(2)(b) of the OPGGS (Environment) Regulations.

The OPGGS (Environment) Regulations require petroleum activities to be carried out in a manner; consistent with the principles of ecologically sustainable development as set out in Section 3A of the EPBC Act. Protected matters, or MNES must be described and considered.

Table 5-4 provides a summary of the relevant MNES that have been identified as existing in and around the OAs, or in the case of floral and faunal species, may exist within the OAs. Additional detail of each MNES is provided in other parts of this document, as indicated in Table 5-4, which summarises the values and sensitivities of other protected areas or places near the OAs.

Table 5-4 Relevant matters of national environmental significance in the Operational Areas

MNES value/ sensitivity	Receptor type	Features present in or near the OAs	
		Within OAs	**Outside OAs**
World Heritage	Cultural feature - historic site	Nil	Nil
	Natural place	Nil	Nil
National heritage	National heritage place or site	Nil	Nil
Wetlands of international importance (Ramsar)	Wetlands	Nil	Gippsland Lakes (Refer to Section 5.4.1). >35km from nearest OA.
Listed threatened species and listed migratory species	Sea birds and shorebirds	Refer to Section 5.5.1.2	-
	Fish	Refer to Section 5.5.1.1	-
	Sharks and rays	Refer to Section 5.5.1.1	-
	Marine mammals	Refer to Section 5.5.1.3	-
	Marine reptiles	Refer to Section 5.5.1.4	-
Listed threatened ecological communities	Littoral rainforest	Nil	Littoral Rainforests and Coastal Vine Thicket (Refer to Section 5.4.2). >20kms from nearest OA.
	Saltmarsh	Nil	Subtropical and Temperate Coastal Saltmarsh (Refer to Section 5.4.2). >35kms from nearest OA.

MNES value/ sensitivity	Receptor type	Features present in or near the OAs	
		Within OAs	**Outside OAs**
	Giant kelp marine forests	Nil	Giant Kelp Marine Forests of South East Australia (Refer to Section 5.4.2). >80kms from nearest OA.
Commonwealth marine areas	Australian marine parks	Nil	South-east Marine Region. East Gippsland Marine Park (Refer to Section 5.4.3) >120kms from nearest OA. Beagle Marine Park (Refer to Section 5.4.3). >90kms from nearest OA.
	Key ecological feature	Upwelling East of Eden (Refer to Section 5.4.5) overlaps FLA OA	Big Horseshoe Canyon (Refer to Section 5.4.5). Bass Cascade (Refer to Section 5.4.5). Shelf Rocky Reefs Southeast Marine Region (Refer to Section 5.4.5).

5.4.1 Wetlands of international importance

The Gippsland Lakes Ramsar Site is the closest wetland to the OAs, located over 35 kilometres from the nearest OA. It is therefore not expected to be impacted by activities in this EP. The next closest wetland is the Corner Inlet Ramsar Site, located over 70 kilometres to the west of the nearest OA.

Covering a vast area, the Gippsland Lakes are a series of large, shallow, coastal lagoons approximately 70 kilometres in length and 10 kilometres wide, separated from the sea by sand dunes. The surface area of the lakes is approximately 364 square kilometres and the three main water bodies are Lake Wellington, Lake Victoria and Lake King.

The Gippsland Lakes Ramsar Site meets five of the Ramsar criteria:1, 2, 4, 6 and 8 (DoEE, 2017a).

The Gippsland Lakes is a particularly good representative example of a natural or near-natural wetland, characteristic of the biogeographical region. It forms one of the largest coastal lagoon systems in the drainage division and contains a distinctive landscape of wetlands and flat coastal plains. The site supports a broad range of wetland types in close proximity to each other, including periodically inundated palustrine marshes, permanently inundated palustrine marshes, shallow lacustrine (lake) features, deep lacustrine features, lagoons with narrow inlets, and broad embayments.

The site supports several nationally threatened wetland fauna species at various stages of their lifecycle including:

- two nationally threatened frog species: green and golden bell frogs (*Ranoidea aurea*) and growling grass frogs (*Ranoidea raniformis*)
- the vulnerable Australian painted snipe (*Rostratula australis*)

- a vulnerable fish species: the Australian grayling (*Prototroctes maraena*)
- three nationally vulnerable and endangered wetland-associated flora species: dwarf kerrawang (*Commersonia prostrata*); swamp everlasting (*Xerochrysum palustre*); and metallic sun-orchid (*Thelymitra epipactoides*).

The site supports habitat and conditions that are important for critical lifecycle stages of a variety of wetland-dependent fauna species. The permanence of the main lakes and the relatively regular flooding of the adjacent wetlands mean that this wetland is an important drought refuge for many water birds and other aquatic species, including as permanent refuges and breeding sites for the two threatened frog species.

The Gippsland Lakes have been identified as being of outstanding importance for waterbirds, regularly supporting more than 20,000 waterfowl. Waterbird species which are considered to have met the one percent population threshold are:

- Red-necked stint (*Calidris ruficollis*)
- Black swan (*Cygnus atratus*)
- Sharp-tailed sandpiper (*Calidris acuminata*)
- Chestnut teal (*Anas castanea*)
- Musk duck (*Biziura lobata*)
- Fairy tern (*Sternula nereis*)
- Little tern (*Sternula albifrons*).

Gippsland Lakes provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish species of direct and indirect fisheries significance. These fish have important fisheries resource values both within and external to the site.

Currently, parts of the Gippsland Lakes system are heavily used for commercial and recreational fisheries and boating activities, while the immediate hinterland has been developed for agricultural use, and limited residential and tourism purposes (DoEE, 2017a).

The Gippsland Lakes are protected as a Ramsar Site by the Lakes National Park and the Gippsland Lakes Coastal Park. The locality of the Ramsar Site is shown in Figure 5-17 (DSEWPC, 2010).

The ecological character description of the Gippsland Lakes Ramsar Site as developed under the requirements of the *National Framework and Guidance for Describing the Ecological Character of Australia's Ramsar Wetlands* (DEWHA, 2008), is summarised in Table 5-5. The information on the limits of acceptable change, also required by the National Framework, are summarised in Table 5-5 (DSEWPC, 2010).

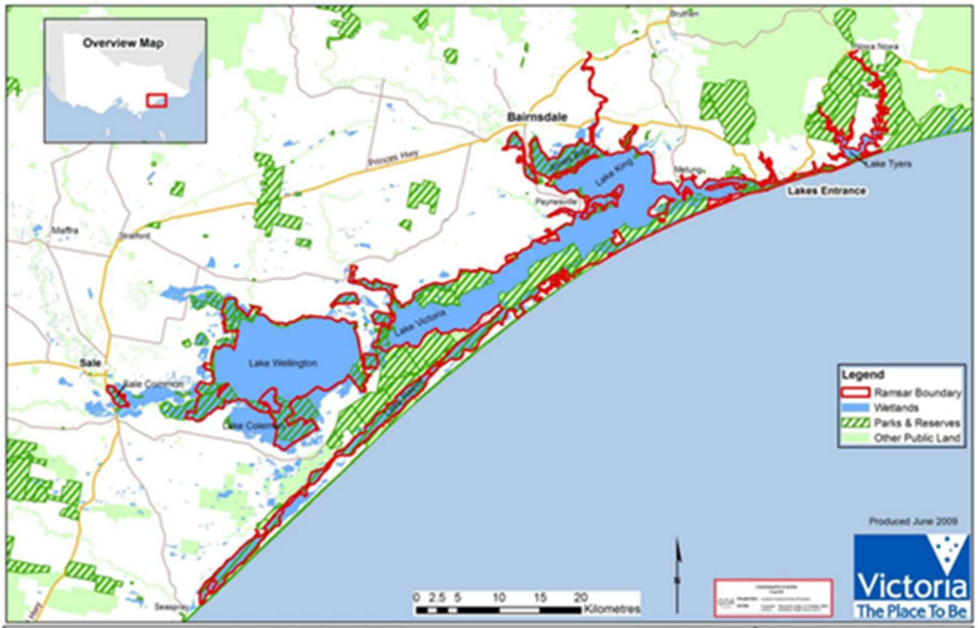


Figure 5-17 Locality of Gippsland Lakes Ramsar Site

Table 5-5 Summary of critical components, processes and services/benefits for the Gippsland Lakes Ramsar Site

Critical components	Critical processes	Critical services/benefits
Wetland habitats: grouped as follows • (C1) marine subtidal aquatic beds (seagrass/aquatic plants). • (C2) coastal brackish or saline lagoons (open water phytoplankton-dominated habitats). • fringing wetlands that can occur within the site as– • (C3) predominantly freshwater wetlands • (C4) brackish wetlands • (C5) saltmarsh/ hypersaline wetlands. Wetland flora and fauna: • (C6) abundance and diversity of waterbirds. • (C7) presence of threatened frog species (green and golden bell frog; growling grass frog).	Hydrological regime: (P1) patterns of inundation and freshwater flows into the wetland system, groundwater influences and marine inflows that affect habitat structure and condition. Waterbird breeding functions: (P2) critical breeding habitats for a variety of waterbird species.	Threatened species: (S1) the site supports an assemblage of vulnerable or endangered wetland flora and fauna that contribute to biodiversity. Fisheries resource values: (S2) the site supports key fisheries habitats and stocks of commercial and recreational significance.

Critical components	Critical processes	Critical services/benefits
• (C8) presence of threatened wetland flora species.		
Supporting components	**Supporting processes**	**Supporting services/benefits**
Other wetland habitats: supported by the site (sand/pebble shores, estuarine waters, etc.). Other wetland fauna: supported by the site (for example, fish, aquatic invertebrates).	Climate: patterns of temperature, rainfall and evaporation. Geomorphology: key geomorphologic/ topographic features of the site. Coastal and shoreline processes: hydrodynamic controls on coasts and shorelines through tides, currents, wind, erosion and accretion. Water quality: water quality influences aquatic ecosystem values, noting the key water quality variables for Gippsland Lakes are salinity, dissolved oxygen, nutrients and sediments. Nutrient cycling, sediment processes and algal blooms: primary productivity and the natural functioning of nutrient cycling/flux processes in waterbodies. Biological processes: important biological processes such as primary productivity.	Tourism and recreation: the site provides and supports a range of tourism and recreational activities that are significant to the regional economy. Scientific research: the site supports and contains features important for scientific research.

5.4.2 Threatened ecological communities

Ecological communities are a group of native flora, fauna and other organisms that naturally occur together and interact in a unique habitat. Their structure, composition and distribution are determined by environmental factors such as soil type, location (e.g. altitude/depth), climate, and water availability, chemistry and movement (e.g. oceanic currents) and thereby changes to any one or a combination of these factors threatens the viability of the community. Species within each ecological community interact with and depend on each other for survival. Ecological communities are important because of their unique combination of native biodiversity, distinctive landscape/seascape values, vital habitat qualities and for the ecosystem services they provide. There are three types of listed threatened ecological communities (TECs) outside of the OAs. None occur within the OAs.

5.4.2.1 Subtropical and Temperate Coastal Saltmarsh

Subtropical and Temperate Coastal Saltmarsh is listed as a vulnerable TEC under the EPBC Act, and its known distribution includes the southern and eastern coasts of Australia. The Subtropical and Temperate Coastal Saltmarsh ecological community occurs within a relatively narrow margin along the Australian coast, within the subtropical and temperate climatic zones;

and includes coastal saltmarsh occurring on islands within these climatic zones (TSSC, 2013). The physical environment for the ecological community is coastal areas under regular or intermittent tidal influence (TSSC, 2013).

The ecological community consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs. Many species of non-vascular plants are also found in saltmarsh, including epiphytic algae, diatoms and cyanobacterial mats. The ecological community is inhabited by a wide range of infaunal and epifaunal invertebrates, and temporary inhabitants such as prawns, fish and birds. It can often constitute important nursery habitat for fish and prawn species. Insects are also abundant and an important food source for other fauna, with some species being important pollinators. The dominant marine residents are benthic invertebrates, including molluscs and crabs that rely on the sediments, vascular plants, and algae, as providers of food and habitat across the intertidal landscape (TSSC, 2013).

The key threats affecting the ecological community include: clearing and fragmentation, infilling, altered hydrology/tidal restriction, invasive species, climate change, mangrove encroachment, damage from recreational activities, pollution (including oil spills), eutrophication, acid sulphate soils, grazing, insect control, salt and other mining activities, and inappropriate fire regimes (TSSC, 2013).

Subtropical and Temperate Coastal Saltmarsh communities are distributed along the Gippsland coastline. The closest OA to these communities is over 34 kilometres away. None occur within the OAs.

5.4.2.2 Littoral Rainforest and Coastal Vine Thicket

The 'Littoral Rainforest and Coastal Vine Thickets of Eastern Australia' is listed as a critically endangered TEC under the EPBC Act. The ecological community is a complex of rainforest and coastal vine thickets on the east coast of Australia influenced by its proximity to the sea; and provides habitat for over 70 threatened plants and animals and provides important stepping stones along the eastern Australian coast for various migratory and marine birds (Department of Environment and Primary Industies, 2014). It also provides an important buffer to coastal erosion and wind damage (TSSC, 2015a) (DoEE, 2017b).

The ecological community occurs as a series of naturally disjunct and localised stands within two kilometres of the eastern coastline of Australia or adjacent to a large saltwater body, such as an estuary on a range of landforms including dunes and flats, headlands and sea cliffs, including offshore islands, from Princess Charlotte Bay, Cape York Peninsula to the Gippsland Lakes in Victoria (TSSC, 2015a). Gippsland Lakes is over 35 kilometres to the nearest OA.

5.4.2.3 Giant Kelp Marine Forests

The Giant Kelp Marine Forests of South East Australia ecological community has been progressively lost, especially on the east coast of Tasmania, due to changing oceanographic conditions and corresponding changes in threatening processes caused by climate change (DSEWPC, 2012a). In Port Phillip Bay, Victoria, particularly along the western and northern coastlines near the metropolitan areas of Geelong and Melbourne, overgrazing by purple urchins (*Heliocidaris erythrogramma*) is the primary cause of kelp destruction (Layton, et al., 2020). The patches that remain in Victoria, South Australia and Tasmania are protected under the EPBC Act as a TEC (DSEWPC, 2012a).

Kelps are very large brown algae that grow on hard subtidal substrates in cold temperate regions. Kelps have a holdfast that attaches to the substrate, a stem-like or trunk-like stipe, and large, flattened, leaf-like blades called fronds. Because kelps require constant water motion to provide nutrients, they are located in relatively high-energy settings. Kelp forests support a diverse animal community of fish, invertebrates, and marine mammals as well as important algal communities (NOAA, 2010). The ecological community is characterised by a closed to semi-closed surface or subsurface canopy of giant kelp (*Macrocystis pyrifera*), and extends between the ocean floor and ocean surface, exhibiting a forest-like structure with a diverse range of organisms occupying its benthic, pelagic and upper-canopy layers (TSSC, 2012). Giant kelp is the only species of kelp to provide this three-dimensional structure from the sea floor to the sea surface (TSSC, 2012). This ecological community occurs on rocky substrate and may occur in rocky coastal waters of Victoria, the closest of which are near Point Hicks, over 80 kilometres from the closest OA.

5.4.3 Commonwealth marine areas

Six marine regions have been identified in Commonwealth waters around Australia. Marine bioregional planning is designed to better protect marine environments, conserve biodiversity and deliver greater certainty to resource users and decision-makers about the marine conservation priorities of the Australian Government. The OAs lie within the South-east Marine Region.

The key conservation values of the South-east Marine Region are (Department of the Environment, 2015a):

- features with high biodiversity and productivity, such as the east Tasmania subtropical convergence zone, Bass Cascade, upwelling east of Eden, seamounts south and east of Tasmania and Bonney Coast upwelling
- breeding and resting areas for Southern right whale
- Migration areas for blue whales (Balaenoptera musculus), fin whales (Balaenoptera physalus), sei whales (Balaenoptera borealis), humpback whales (Megaptera novaeangliae) and Southern right whales
- foraging areas for Australian sea lion (*Neophoca cinerea*), white shark, Harrison's dogfish (*Centrophorus harrissoni*), killer whale (*Orcinus orca*), sei whales, Australasian gannet (*Morus serrator*), fairy prion (*Pachyptila turtur*), black-faced cormorant (*Phalacrocorax fuscescens*), little penguin (*Eudyptula minor*), crested tern (*Thalasseus bergii*), and several species of seal, penguin, albatross, petrel, shearwater and gulls
- wrecks of MV City of Rayville, SS Cambridge and ketch Eliza Davies
- ten provincial bioregions and 17 seabed types are represented in the region.

5.4.4 Australian marine parks

Australian marine parks have been established in Commonwealth waters to contribute to the long-term conservation of marine ecosystems and protect marine biodiversity found in them, while also allowing for sustainable use of natural resources. The Australian marine parks are protected areas.

The OAs do not occur within any Australian marine parks. The closest are the East Gippsland Marine Park, over 120 kilometres to the east and the Beagle Marine Park, over 90 kilometres to the southwest of the nearest OA.

5.4.4.1 East Gippsland Marine Park

The East Gippsland Marine Park (covering 4137 square kilometres) is off the northeast corner of Victoria, on the continental slope and escarpment and the closest of the marine parks to the OAs. The full area of the East Gippsland Marine Park is designated as a multiple use zone by the International Union for Conservation of Nature (IUCN)(IUCN VI).

The EAC funnels warm waters through the marine park over the complex seabed features causing eddies to form off Cape Howe. This results in conditions in which phytoplankton flourish, thereby attracting and supporting an abundance of marine life. The main features of the seabed are the continental shelf, the steep escarpments and deep canyons.

Details of the East Gippsland Marine Park are listed in Table 5-6 (Director of National Parks, 2013).

Table 5-6 East Gippsland Commonwealth Marine Park

<table>
<tr><th>Proclaimed</th><td colspan="4">28 June 2007</td></tr>
<tr><th>IUCN category assigned by this Management Plan and reserve management zone name</th><td colspan="4">IUCN VI
Multiple use zone</td></tr>
<tr><th rowspan="2">Assigned zones in reserve</th><td>IUCN Ia</td><td>IUCN II</td><td>IUCN IV</td><td>IUCN VI</td></tr>
<tr><td></td><td></td><td></td><td>Multiple use zone</td></tr>
<tr><th>Depth of reserve below seabed</th><td colspan="4">100m</td></tr>
<tr><th>Total area</th><td colspan="4">4137km^2 (413,700ha).</td></tr>
<tr><th>Major conservation values</th><td colspan="4">Examples of ecosystems, habitats and communities associated with the Southeast Transition and associated with seabed features: abyssal plain/deep ocean floor; canyon; escarpment; knoll/abyssal hill; and slope.
Features with high biodiversity and productivity include Bass Cascade and upwelling east of Eden.
Important foraging area for: wandering albatross (Diomedea exulans); black-browed albatross (Thalassarche melanophris); Indian yellow-nosed albatross (Thalassarche chlororhynchos); shy albatross (Thalassarche cauta); great-winged petrel (Pterodroma macroptera); wedge-tailed shearwater (Ardenna pacifica); and cape petrel (Daption capense).
• Important migration area for humpback whales.</td></tr>
<tr><th>Location</th><td colspan="4">The East Gippsland Commonwealth Marine Reserve is off the northeast corner of Victoria, on the continental slope and escarpment.</td></tr>
<tr><th>General description of the reserve</th><td colspan="4">The East Gippsland Commonwealth Marine Reserve contains representative samples of an extensive network of canyons, continental slope and escarpment at depths from 600m to >4000m.</td></tr>
</table>

	The geomorphic features of this reserve include rocky-substrate habitat, submarine canyons, escarpments and a knoll, which juts out from the base of the continental slope. The reserve includes both warm and temperate waters, which create habitat for free-floating aquatic plants or microscopic plants (i.e. phytoplankton) communities. Complex seasonality in oceanographic patterns influences the biodiversity and local productivity. The EAC brings subtropical water from the north, and around Cape Howe the current forms large eddies, with a central core of warm water. Around the outside of the eddies, cooler, nutrient-rich waters mix with the warm water creating conditions for highly productive phytoplankton growth, which supports a rich abundance of marine life. During winter, upwellings of cold water may occur and bring nutrient-rich waters to the surface, boosting productivity. Many oceanic seabirds forage in these waters, including albatrosses (e.g. wandering, black-browed, Indian yellow-nosed and shy albatrosses), the great-winged petrel, wedge-tailed shearwater and cape petrel. Humpback whales pass by during their migrations north and south along the eastern seaboard.

5.4.4.2 Beagle Marine Park

The Beagle Marine Park (covering 2928 square kilometres) lies entirely within Bass Strait, encompassing Tasmania's Kent Group Marine Reserve and the Hogan and Curtis Island groups. To the northeast is Victoria's Wilsons Promontory Marine National Park. The full area of the Beagle Marine Park is designated as a multiple use zone (IUCN VI).

The Beagle Marine Park was once dry land which connected mainland Australia to Tasmania. After the ending of the last ice-age, the melting glaciers caused sea levels to rise and the connection to Tasmania was lost leaving the Bass Strait islands and an area of shallow waters 50-70 metres in depth. Detailed information on the Beagle Marine Park is presented in Table 5-7 (Director of National Parks, 2013).

Table 5-7 Beagle Commonwealth Marine Park

Proclaimed	28 June 2007			
IUCN category assigned by this Management Plan and reserve management zone name	IUCN VI Multiple use zone			
Assigned zones in reserve	IUCN Ia	IUCN II	IUCN IV	IUCN VI
				Multiple use zone
Depth of reserve below seabed	100m			
Total area	2928 km^2 (292,800ha)			

Major conservation values	Ecosystems, habitats and communities associated with the Southeast Shelf Transition and associated with seabed features: basin; plateau; shelf; and sill. Important migration and resting on migration area for Southern right whales. Important foraging area for: Australian fur seals; killer whales; shy albatrosses; Australasian gannets; short-tailed shearwaters (*Ardenna tenuirostris)*, Pacific gulls (*Larus pacificus*); silver gulls (*Chroicocephalus novaehollandiae*) Crested terns; common diving petrel (*Pelecanoides urinatrix*); fairy prion; black-faced cormorant; little penguin; and white shark. • Cultural and heritage sites for the wreck of the steamship SS Cambridge; and the wreck of the ketch Eliza Davies.
Location	The Beagle Commonwealth Marine Reserve lies entirely within Bass Strait, with its north-western edge abutting Victorian waters south-east of Wilson’s Promontory. It is a shallow-water reserve surrounding a collection of Bass Strait islands.
General description of the reserve	The Beagle Commonwealth Marine Reserve represents an area of shallow continental shelf ecosystems in depths of about 50-70m that extends around south-eastern Australia to the east of Tasmania. The seabed that it covers formed a land bridge between Tasmania and Victoria during the last ice-age 10,000 years ago. Its boundary encloses Tasmania’s Kent Group Marine Reserve and the Hogan and Curtis Island groups. Nearby to the northeast is Victoria’s Wilsons Promontory Marine National Park. The reserve encompasses the fauna of central Bass Strait, which is expected to be especially rich based on studies of several seabed – dwelling animal groups. Its ecosystems are similar to those documented for the deeper sections of the Kent Group Marine Reserve, especially those based around habitats of rocky reefs supporting beds of encrusting, erect and branching sponges, and sediment composed of shell grit with patches of large sponges and sparse sponge habitats. Islands encompassed by the reserve and nearby islands support important breeding colonies for many seabirds and for the Australian fur seal. The waters of the reserve provide an important foraging area for those species breeding nearby. The rich marine life also attracts top predators, such as the great white shark and killer whales. The SS Cambridge, a British freighter, which lies in the reserve to the east of Wilson’s Promontory, was sunk in 1940 by a WWII mine. The trading ketch Eliza Davies, which lies in the reserve to the east of Wilson’s Promontory, sunk under tow in 1924.

5.4.5 Key ecological features

Key ecological features 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. Key ecological features are not MNES and have no legal status in their own right. However, they are components of the Commonwealth marine area.

One OA covered by this EP (FLA) overlaps the spatially defined area of the upwelling east of Eden KEF as identified in the *National Conservation Values Atlas* (DAWE, 2022e). The next closest spatially defined KEFs is the Big Horseshoe Canyon, located over 70 kilometres to the east of the nearest OA.

Two other KEFs that are not spatially defined, the Bass Cascade and the shelf rocky reefs and hard substrates (South-east Marine Region) are described below.

5.4.5.1 Upwelling east of Eden

The upwelling east of Eden is defined as a KEF as it is an area of high productivity and aggregations of marine life.

Dynamic eddies of the EAC cause episodic productivity events when they interact with the continental shelf and headlands. The episodic mixing and nutrient enrichment events drive phytoplankton blooms that are the basis of productive food chains including zooplankton, copepods, krill and small pelagic fish (DAWE, 2022h).

The upwelling supports regionally high primary productivity that supports fisheries and biodiversity, including top order predators, marine mammals and seabirds. This area is one of two feeding areas for blue whales and humpback whales, known to arrive when significant krill aggregations form. The area is also important for seals, other cetaceans, sharks and seabirds.

This feature displays seasonal and annual variation, and is present along the eastern Victorian and southern New South Wales coasts (DAWE, 2022h).

5.4.5.2 Big Horseshoe Canyon

Big Horseshoe Canyon is defined as a KEF as it is an area of high productivity and aggregations of marine life.

The steep, rocky slopes of the Big Horseshoe Canyon provide hard substrate habitat for attached large epifauna. Sponges and other habitat forming species provide structural refuges for benthic fishes, including the commercially important pink ling (*Genypterus blacodes*).

The Big Horseshoe Canyon is the largest south-eastern canyon sampled for benthic biodiversity (Williams, et al., 2009). It has a total area of 319 square kilometres in 1500 metres depth that supports a rich, abundant, filter-feeding benthic megafauna, including large sponges in dense beds of large individuals at 120 metres and at 300-400 metres, dense stands of the stalked crinoid (*Metacrinus cyaneus*) in 200-300 metres, and many species of octocoral, especially gold corals (*Gerardia* spp.), at depths >700 metres (Kloser, Williams, & Butler, 2001). It is the only known temperate location of the stalked crinoid.

Big Horseshoe Canyon lies south of the coast of eastern Victoria. This feature is the eastern most arm of the Bass Canyon system (Department of the Environment, 2015a).

5.4.5.3 Shelf rocky reefs and hard substrates (South-east Marine Region)

Rocky reefs and hard grounds are located in all areas of the South-east Marine Region continental shelf including Bass Strait, in 50 metres to 150-220 metres water depth. They support macroalgae and sessile invertebrates and provide habitat and shelter for fish and are important for aggregations of biodiversity and enhanced productivity. This KEF has not been spatially defined and hence reef locations are not specifically known however it is expected to occur along the continental shelf of Bass Strait. Historical ROV surveys of platforms (based on Esso ROV inspection data from 2010, 2013 and 2014) have not detected variances in abundance of biota on the seabed surrounding the SPJs in this EP which may be indicative of hard substrates occurring. South East Reef however, is mapped to exist in the VIC/L5 area and thought to possess some low-relief limestone reef features (Bax & Williams, 2001). The reef is situated in ~70 m water depth with the nearest SPJs being FTA, CBA and HLA (AIMS, 2022a).

5.4.5.4 Bass Cascade (along the Bass Canyon system)

The Bass Cascade refers to the "underwater waterfall" effect brought about by the northward flow of Bass Strait waters in winter which are more saline and slightly warmer than surrounding Tasman Sea waters. As the water approaches the mainland in the area of the Bass Canyon group it forms an undercurrent that flows down the continental slope. The cascading water has a displacing effect causing nutrient rich waters to rise, which in turn leads to increased primary productivity in those areas. The cascading water also concentrates nutrients and some fish and whales are known to aggregate along its leading edge. The Bass Cascade occurs during winter months only.

This KEF has not been spatially defined and hence is not mapped, however it is expected to occur within the OAs.

5.5 Ecological environment

5.5.1 Fauna

The EPBC Act Protected Matters Search Tool was used to identify the listed marine, migratory and threatened faunal species (or species habitat) that occur, or may occur in the OAs. Table 5-8 provides a summary of the protected species for each of the OAs. The summary shows that there is a similarity across sites for the range of protected bird, reptile and fish species that occur or may occur in the OAs. Noted differences are seen for the marine mammals where the number of protected species doubles in the eastern half of Bass Strait. This is linked with the proximity to the canyon and the increasing water depth. Mammals that have a tendency to occur in deeper and cooler waters such as the beaked whales are more likely to be in OAs that are closer to the canyon where the water depth increases rapidly than the platforms that are on the shallower waters of the Gippsland Basin. A full listing of protected species in the OAs per the Protected Matters Search Tool is provided in Appendix D1.

Table 5-8 EPBC Protected Matters Search Tool summary for each Operational Area

Fauna		WTA	BMA	WKF	KFA	KFB	MKA	CBA	HLA	FTA	FLA
Birds	TOTAL	33	34	35	35	35	35	35	35	35	35
	Threatened Category[1] [x] refer Appendix D1	25 Curlew sandpiper (CE), eastern curlew (CE) E = 6[x] V = 17[x]	25 Curlew sandpiper (CE), eastern curlew (CE) E = 6[x] V = 17[x]	24 Curlew sandpiper (CE), eastern curlew (CE) E = 7[x] V = 15[x]	26 Curlew sandpiper (CE), eastern curlew (CE) E = 7[x] V = 17[x]	26 Curlew sandpiper (CE), eastern curlew (CE) E = 7[x] V = 17[x]	26 Curlew sandpiper (CE), eastern curlew (CE) E = 7[x] V = 17[x]	26 Curlew sandpiper (CE), eastern curlew (CE) E = 7[x] V = 17[x]	26 Curlew sandpiper (CE), eastern curlew (CE) E = 7[x] V = 17[x]	26 Curlew sandpiper (CE), eastern curlew (CE) E = 7[x] V = 17[x]	26 Curlew sandpiper (CE), eastern curlew (CE) E = 7[x] V = 17[x]
	Migratory	17	18	19	19	19	19	19	19	19	19
	Migratory wetland	6	6	6	6	6	6	6	6	6	6
	BIA	7	8	8	8	8	8	8	8	8	8
	Breeding	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Foraging	Shy albatross (LO) KO = 6[x]	Shy albatross (LO) KO = 7[x]	Shy albatross (LO) KO = 7[x]	Shy albatross (LO) KO = 7[x]	Shy albatross (LO) KO = 7[x]	Shy albatross (LO) KO = 7[x]	Shy albatross (LO) KO = 7[x]	Shy albatross (LO) KO = 7[x]	Shy albatross (LO) KO = 7[x]	Shy albatross (LO) KO = 7[x]
	Distribution	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Marine Mammals	TOTAL	15	15	16	16	30	30	30	30	30	30
	Threatened Category[1] [x]refer Appendix D1	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)	5 Blue whale (E) Southern right whale (E) Humpback whale (V) Fin whale (V) Sei whale (V)
	Migratory	8	8	9	9	11	11	11	11	11	11
	Cetaceans	13	13	14	14	28	28	28	28	28	28
	Whale	7	7	8	8	19	19	19	19	19	19
	Dolphin	6	6	6	6	9	9	9	9	9	9
	Pinnipeds (seals)	2 Australian fur seal+, Long-nosed fur seal++	2 Australian fur seal+, Long-nosed fur seal++	2 Australian fur seal+, Long-nosed fur seal++	2 Australian fur seal+, Long-nosed fur seal++	2 Australian fur seal+, Long-nosed fur seal++	2 Australian fur seal+, Long-nosed fur seal++	2 Australian fur seal+, Long-nosed fur seal++	2 Australian fur seal+, Long-nosed fur seal++	2 Australian fur seal+, Long-nosed fur seal++	2 Australian fur seal+, Long-nosed fur seal++
	BIA	2	2	2	2	2	2	2	2	2	2

Fauna		WTA	BMA	WKF	KFA	KFB	MKA	CBA	HLA	FTA	FLA
	Breeding	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Foraging	Blue whale (LO)	Blue whale (LO)	Blue whale (LO)	Blue whale (LO)	Blue whale (LO)	Blue whale (LO)	Blue whale (LO)	Blue whale (LO)	Blue whale (LO)	Blue whale (LO)
	Distribution	Southern right whale (KO)	Southern right whale (KO)	Southern right whale (KO)	Southern right whale (KO)	Southern right whale (KO)	Southern right whale (KO)	Southern right whale (KO)	Southern right whale (KO)	Southern right whale (KO)	Southern right whale (KO)
Reptiles	TOTAL	3	3	3	3	3	3	3	3	3	3
	Threatened Category[1] [x]refer Appendix D1.	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)	Leatherback turtle+++ (E) Loggerhead turtle (E) Green turtle (V)
Fish (incl Sharks)	TOTAL	34	34	34	34	38	38	38	38	38	38
	Threatened Category[1] [x]refer Appendix D1	6 Australian grayling (V) Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD)	6 Australian grayling (V) Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD)	5 Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD)	5 Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD)	9 Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD) Eastern gemfish (CD) Harrisons dogfish*(CD) Southern Dogfish **(CD) Orange roughy ***(CD)	9 Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD) Eastern gemfish (CD) Harrisons dogfish*(CD) Southern Dogfish **(CD) Orange roughy ***(CD)	9 Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD) Eastern gemfish (CD) Harrisons dogfish*(CD) Southern Dogfish **(CD) Orange roughy ***(CD)	9 Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD) Eastern gemfish (CD) Harrisons dogfish*(CD) Southern Dogfish **(CD) Orange roughy ***(CD)	9 Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD) Eastern gemfish (CD) Harrisons dogfish*(CD) Southern Dogfish **(CD) Orange roughy ***(CD)	9 Whale shark (V) White shark # (V) Blue warehou (CD) School shark##(CD) Southern bluefin tuna (CD) Eastern gemfish (CD) Harrisons dogfish*(CD) Southern Dogfish **(CD) Orange roughy ***(CD)
	Migratory	5 Oceanic whitetip shark Porbeagle^ Shortfin mako^^ Whale shark White shark#	4 Porbeagle^ Shortfin mako^^ Whale shark White shark#	5 Oceanic whitetip shark Porbeagle^ Shortfin mako^^ Whale shark White shark#	5 Oceanic whitetip shark Porbeagle^ Shortfin mako^^ Whale shark White shark#	5 Oceanic whitetip shark Porbeagle^ Shortfin mako^^ Whale shark White shark#	5 Oceanic whitetip shark Porbeagle^ Shortfin mako^^ Whale shark White shark#	5 Oceanic whitetip shark Porbeagle^ Shortfin mako^^ Whale shark White shark#	5 Oceanic whitetip shark Porbeagle^ Shortfin mako^^ Whale shark White shark#	5 Oceanic whitetip shark Porbeagle^ Shortfin mako^^ Whale shark White shark#	5 Oceanic whitetip shark Porbeagle^ Shortfin mako^^ Whale shark White shark#
	Sharks	6	5	6	6	8	8	8	8	8	8
	BIA	1	1	1	1	1	1	1	1	1	1
	Breeding	N/A	White shark (KO)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Foraging	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Fauna		WTA	BMA	WKF	KFA	KFB	MKA	CBA	HLA	FTA	FLA
	Distribution	White shark (KO)	N/A	White shark (KO)	White shark (KO)	White shark (KO)	White shark (KO)	White shark (KO)	White shark (KO)	White shark (KO)	White shark (KO)

LO Likely to occur
KO Known to occur
+ Australian fur seal also known as Australo-African fur seal
++ Long-nosed fur seal++ also known as New Zealand fur seal
+++ Leatherback turtle also known as leathery turtle, luth
# White shark also known as great white shark
School shark also known as eastern school shark, snapper shark, tope, soupfin shark
^ Porbeagle shark also known as mackerel shark
^^ Shortfin mako also known as mako shark
* Harrisson's dogfish also known as endeavour dogfish, dumb gulper shark, Harrison's deepsea dogfish
** Southern dogfish also known as endeavour dogfish, little gulper shark
*** Orange roughy also known as deep-sea perch, red roughy

1 Threatened Category: Critically Endangered (CE); Endangered (E); Vulnerable (V); and Conservation Dependent (CD). Refer to Appendix D1 for lists of species.

5.5.1.1 Fish

Fish fall into two categories, bony fish and cartilaginous fish. Bony fish are a diverse group of fish that have skeletons primarily composed of bone tissue. The vast majority of fish are members of Osteichthyes, which is an extremely diverse and abundant group consisting of 45 orders, and over 435 families and 28,000 species. Cartilaginous fish are jawed vertebrates with skeletons made of cartilage rather than bone. This group includes two subclasses:

- Elasmobranchii (sharks, rays, skates and sawfish)
- Holocephali (chimaeras or ghost sharks).

All the EPBC Act protected fish are listed in Table 5-9. There are few differences between the OAs and these are discussed below. Table 5-10 lists the key threats and management actions for threatened fish species or species habitat that may occur within the OAs.

The Australian grayling is a small to medium-sized, slender, silvery fish with soft-rayed fins. It is endemic to south-eastern Australia, including Victoria, Tasmania and New South Wales, and is a migratory species that inhabits estuarine waters and coastal seas as larvae/juveniles, but spend most of their lives in freshwater, inhabiting rivers and streams as adults (DAWE, 2022g). It is for this reason that it is listed as ‘may occur’ for the near shore platforms, being WTA and BMA. Two species of shark, the whale shark and the white shark, both listed as vulnerable, are listed for all OAs. The whale shark may occur in all of the OAs. In Australia, the whale shark is most commonly seen in waters off northern Western Australia, Northern Territory and Queensland and occasionally Victoria and South Australia.

There is a BIA (nursery area) for the white shark that overlaps with the BMA OA. All other areas covered by the Campaign #1 SPJs are areas where white sharks are known to occur. The white shark has a range extending from central Queensland, around the south coast, to northwest Western Australia (DSEWPC, 2013). The shark is primarily found on the continental shelf and coastal waters, including inshore waters around oceanic islands. The white shark is not evenly distributed throughout its range, with observations more frequent in some areas, including those around fur seal or sea lion colonies (DSEWPC, 2013). Recent studies have found that juvenile white sharks (<3 metres) occupy estuaries in Corner Inlet, Victoria during October to January (Harasti, Lee, Bruce, Gallen, & Bradford, 2017). A BIA for breeding (nursery ground) has been established in the coastal region extending east from Wilsons Promontory (Figure 5-18).

The other differences between the OAs are attributed to the conservation dependant species, all of which are commercial fishery species which are threatened and may occur at HLA, FTA, CBA, MKA, KFB and FLA. These are the Eastern gemfish (*Rexea solandri*), Harrisson’s dogfish, also known as the dumb gulper shark, the Southern dogfish (*Centrophorus zeehaani)*, also known as the little gulper shark and the orange roughy (*Hoplostethus atlanticus*) which is also known as the deep-sea perch or red roughy. Two other conservation dependant species occur across all the OAs, these are the blue warehou (*Seriolella brama*) and the Southern bluefin tuna (*Thunnus maccoyii*). Many of these are fished by the Southern and Eastern Scalefish and Shark Fishery (SESSF) and have limits set on the total allowable catch (refer to Section 5.6.1).

Table 5-9 EPBC Act-listed fish species in the Operational Areas

Scientific name	Common name	Threatened species	Migratory species	Listed marine species
Fish				
Heraldia nocturna	Upside-down pipefish	-	-	✓
Hippocampus abdominalis	Big-belly seahorse	-	-	✓
Hippocampus breviceps	Short-head seahorse	-	-	✓
Hippocampus minotaur	Bullneck seahorse	-	-	✓
Histiogamphelus briggsii	Briggs' crested pipefish	-	-	✓
Histiogamphelus cristatus	Rhino pipefish	-	-	✓
Hoplostethus atlanticus	Orange roughy	CD	Only in OAs for HLA, FTA, CBA, MKA, KFB and FLA	
Hypselognathus rostratus	Knife-snout pipefish	-	-	✓
Kaupus costatus	Deep-bodied pipefish	-	-	✓
Kimblaeus bassensis	Trawl pipefish	-	-	✓
Leptoichthys fistularius	Brushtail pipefish	-	-	✓
Lissocampus caudalis	Smooth pipefish	-	-	✓
Lissocampus runa	Javelin pipefish	-	-	✓
Maroubra perserrata	Sawtooth pipefish	-	-	✓
Mitotichthys semistriatus	Halfbanded pipefish	-	-	✓
Mitotichthys tuckeri	Tucker's pipefish	-	-	✓
Notiocampus ruber	Red pipefish	-	-	✓
Phyllopteryx taeniolatus	Weedy seadragon	-	-	✓

Scientific name	Common name	Threatened species	Migratory species	Listed marine species
Seriolella brama	Blue warehou	CD	-	-
Prototroctes maraena	Australian grayling	V	Only in OAs for BMA and WTA	
Rexea solandri (eastern Australian population)	Eastern gemfish	CD	Only in OAs for HLA, FTA, CBA, MKA, KFB and FLA	
Solegnathus robustus	Robust spiny pipehorse	-	-	✓
Solegnathus spinosissimus	Australian spiny pipehorse	-	-	✓
Solenostomus cyanopterus	Robust ghostpipefish	-	-	✓
Solenostomus paradoxus	Ornate ghostpipefish	-	-	✓
Stigmatopora argus	Spotted pipefish	-	-	✓
Stigmatopora nigra	Widebody pipefish	-	-	✓
Stipecampus cristatus	Ringback pipefish	-	-	✓
Syngnathoides biaculeatus	Double-ended pipehorse	-	-	✓
Thunnus maccoyii	Southern bluefin tuna	CD	-	
Urocampus carinirostris	Hairy pipefish	-	-	✓
Vanacampus margaritifer	Mother-of-pearl pipefish	-	-	✓
Vanacampus phillipi	Port Phillip pipefish	-	-	✓
Vanacampus poecilolaemus	Australian long-snout pipefish	-	-	✓
Sharks				
Carcharhinus longimanus	Oceanic whitetip shark	-	✓	
Centrophorus harrissoni	Harrisson's dogfish	CD	Only in OAs for HLA, FTA, CBA, MKA, KFB and FLA	

Scientific name	Common name	Threatened species	Migratory species	Listed marine species
Centrophorus zeehaani	Southern dogfish	CD	Only in OAs for HLA, FTA, CBA, MKA, KFB and FLA	
Galeorhinus galeus	School shark	CD	-	-
Carcharodon carcharias	White shark	V	✓	-
Isurus oxyrinchus	Shortfin mako	-	✓	-
Lamna nasus	Porbeagle	-	✓	-
Rhincodon typus	Whale shark	V	✓	-
Threatened species: V Vulnerable CE Critically CD Conservation Dependent	Type of presence: MO Species or species habitat may occur within the area			

Note: Species highlighted in blue text only occur in the OAs indicated in the last column.

Table 5-10 Key threats and management actions for threatened fish species or species habitat that may occur within the Operational Areas

Common name	Conservation Advice or Recovery Plan	Key threats (relevant to petroleum activities)	Relevant to activities in this EP
White shark	*Recovery Plan for the White Shark (Carcharodon carcharias)* (DSEWPC, 2013)	• Habitat degradation in shallower waters (including development and pollution) identified as secondary threat	N/A
Whale shark	*Approved Conservation Advice for Rhincodon typus (Whale Shark)* (TSSC, 2015b)	• Vessel strike • Habitat disruption from mineral exploration, production and transportation • Marine debris	N/A

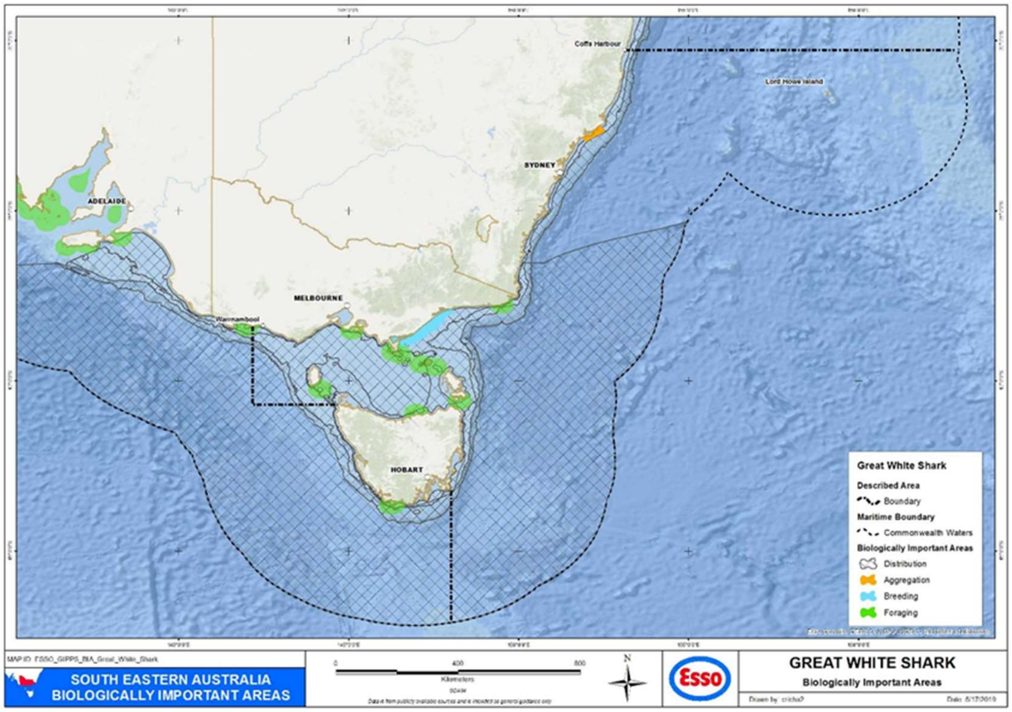


Figure 5-18 Biologically Important Areas for the white shark

5.5.1.2 Birds

Birds in the marine environment can include both seabirds and shorebirds:

- seabirds refers to those species of bird whose normal habitat and food sources are derived from the ocean (both coastal and pelagic); seabirds include such species as pelicans, gannets, cormorants, albatrosses and petrels
- shorebirds (sometimes referred to as wading birds) refers to those species of bird commonly found along sandy or rocky shorelines, mudflats, and shallow waters. Shorebirds include such species as plovers and sandpipers.

EpBC Act protected birds are listed in Table 5-11. There are few differences between the OAs and these are discussed below. Table 5-12 lists the key threats and management actions for seabird and shorebird threatened species or species habitat that may occur within the OAs.

5.5.1.2.1 Albatross

There are 14 species of albatross common to all OAs all of which are either vulnerable or endangered. Albatross species exhibit a broad range of diets and foraging behaviours; this combined with their ability to cover vast oceanic distances, means all waters within Australian jurisdiction can be considered foraging habitat for this species (DSEWPC, 2011a).

Albatrosses typically feed offshore, mainly along the edge of the continental shelf and over open waters where they catch fish and cephalopods (e.g. squid, cuttlefish) by diving into the water (DSEWPC, 2011a). Known foraging BIAs are identified for six species: wandering, Buller's (*Thalassarche bulleri)*, Indian yellow-nosed, shy, Campbell (*Thalassarche impavida)* and Black-browed (DoEE, 2015a). The Chatham albatross' (*Thalassarche eremita)* principal foraging range is in coastal waters off eastern and southern New Zealand, and Tasmania

(DAWE, 2022f). For this reason it is not expected to occur in the western most OAs, being WTA and BMA.

Figure 5-19 shows the BIAs for albatross species.

5.5.1.2.2 Petrels

There are five species of petrel that may occur in all the OAs, the Southern giant petrel (*Macronectes giganteus)* and the Gould's petrel (*Pterodroma leucoptera)* that are endangered and the others vulnerable (Table 5-15). Similar to albatrosses, the petrels have a diverse foraging range, and all waters within Australian jurisdiction can be considered foraging habitat for this species. Typical diet for petrels includes cephalopods (e.g. squid) and fish, and prey is predominately caught by surface-seizing (DSEWPC, 2011a).

Figure 5-20 shows the BIAs for petrel species.

5.5.1.2.3 Shearwaters

The shearwaters represent the most abundant seabird in Australia. There are three species of shearwater that may occur within the OAs. The Short-tailed shearwater occurs in and has a known BIA for foraging in all OAs except for WTA (Table 5-11). It is a highly pelagic species breeding annually during the austral spring/summer (from September to April) on the many islands off the continent's southern coast, including Gabo Island and Phillip Island (Berlincaourt, M & Arnould, 2015) and migrate to areas in the northern Pacific Ocean during winter (Museum Vicoria Collections, 2022).

5.5.1.2.4 Sandpipers

Four sandpiper species are known to occur across the OAs. Sandpiper refers to the small- to medium-sized shorebirds (15-30 square metres) in the family Scolopacidae which are seen at beaches and inland mudflats during migration and wintering. They are all migratory, breeding in the northern hemisphere Arctic and sub-Arctic regions and travel in large flocks when migrating. The majority of these species eat small invertebrates probed out of the mud or soil or sand with their sensitive bills. The critically endangered Curlew Sandpiper (*Calidris ferruginea*) sighted population in Australia has significantly declined. Breeding does not occur in Australia, it is part of the East Asian-Australasian Flyway and breeding occurs in Siberia, however its wetland resting habitat on its winter migration, particularly in East Asia, is being threatened by degradation through habitat loss, pollution and other human disturbance resulting in an estimated reduction in population size in Australia by greater than 80 percent (Department of the Environment, 2015b). In Australia the main threat for all sandpipers is from disturbance from humans and their domestic animals.

Also in the Scolopacidae family are two other listed wetland migratory species. One of these, the Eastern curlew (*Numenius madagascariensis)* is critically endangered and the other, the red knot (*Calidris canutus*) is endangered. These have similar breeding habits as the sandpipers. Their feeding habitat is generally coastal with large intertidal mudflats or sandflats and they roost on sandy beaches, sandbars, and spits. They are migratory species, breeding in the northern hemisphere with an annual migration to Australia during their winter (DoEE, 2015b).

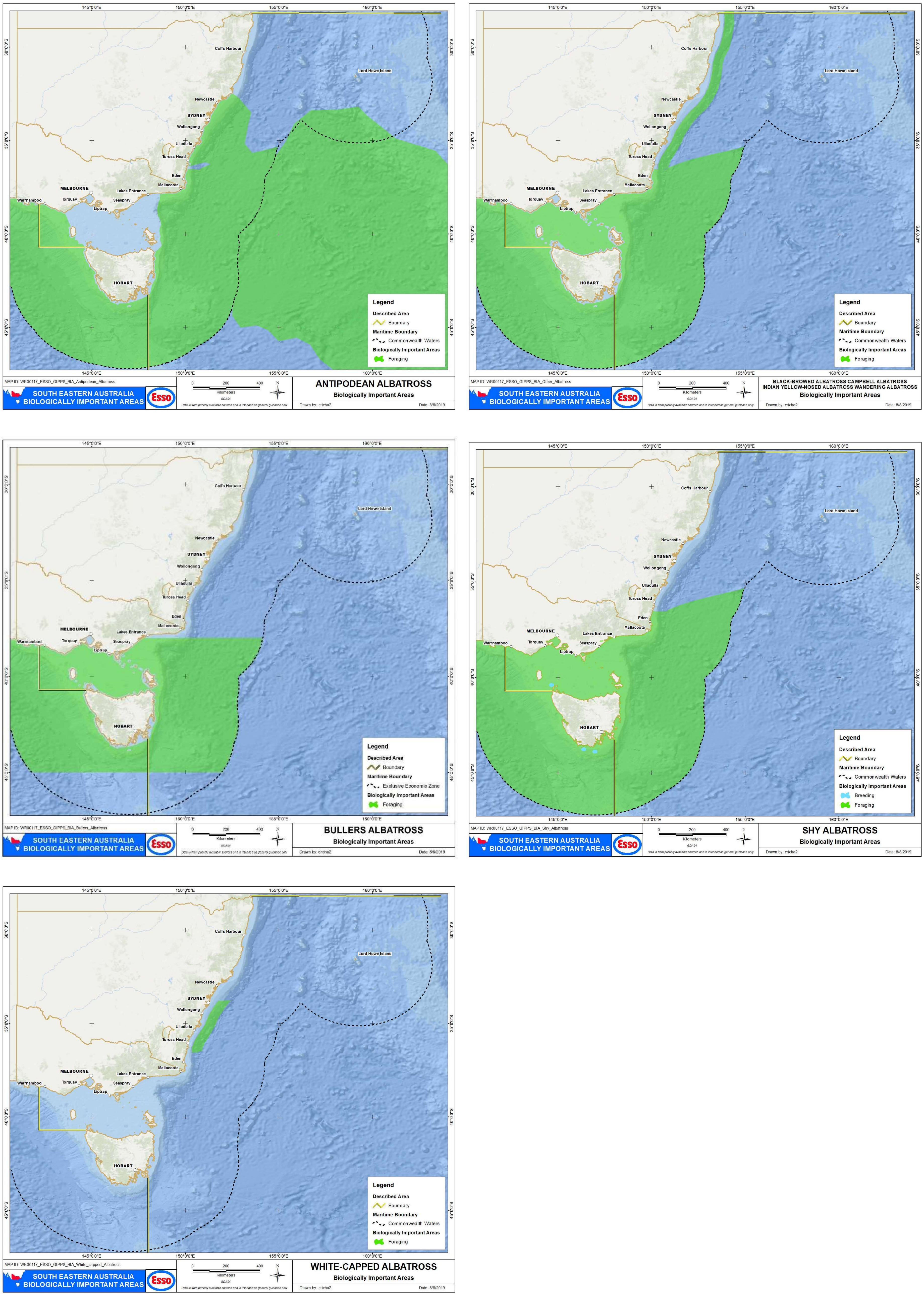
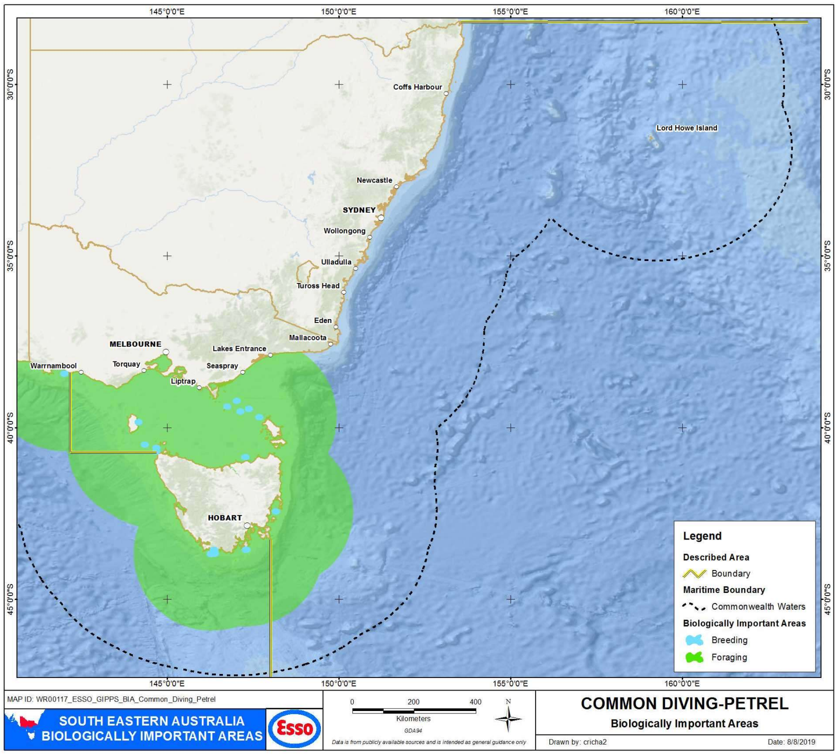


Figure 5-19 Biologically Important Areas for albatross species



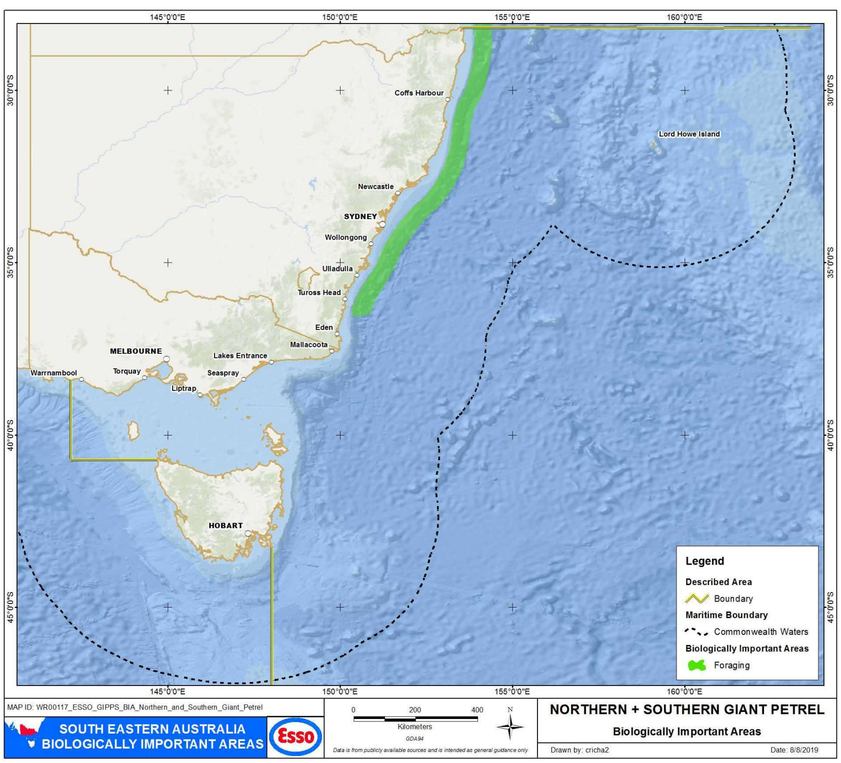
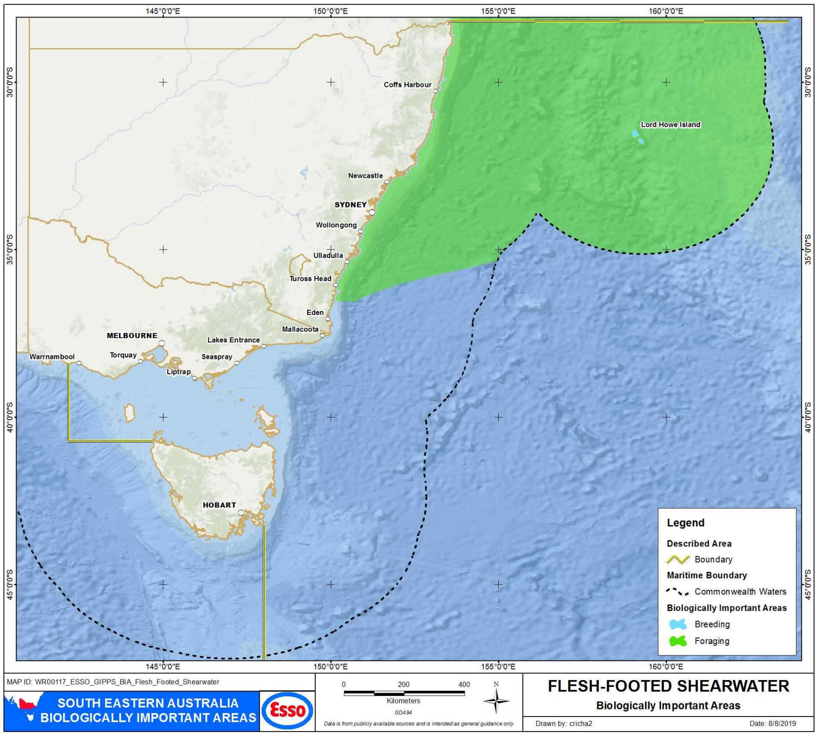


Figure 5-20 Biologically Important Areas for petrel species



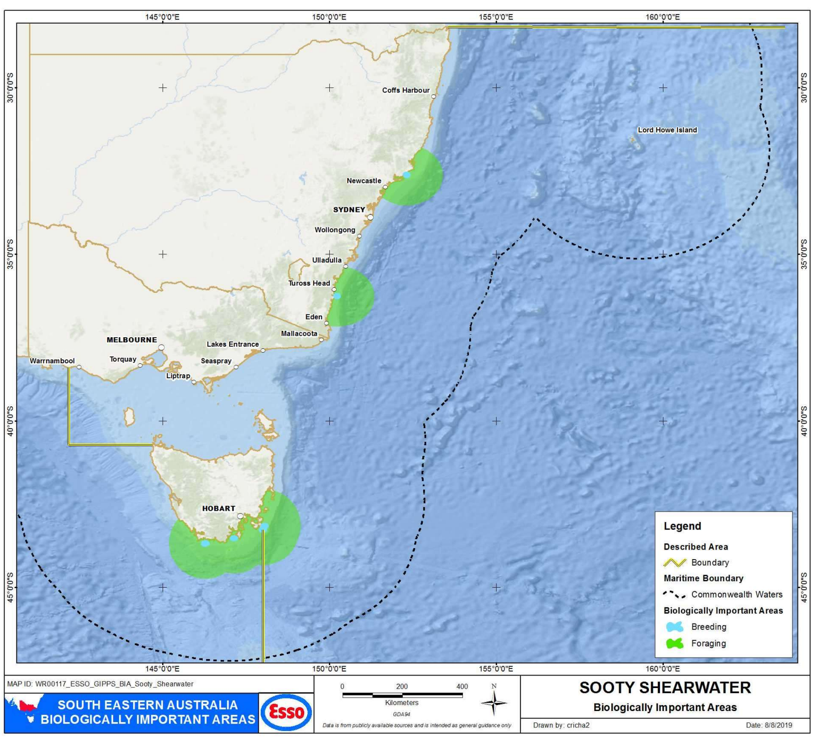


Figure 5-21 Biologically Important Areas for shearwater species

5.5.1.2.5 Other

Within Australia, the vulnerable fairy prion (southern) breeds only on Macquarie Island (outside of the OAs) and outside Australia is also known to breed in other sub-Antarctic islands including New Zealand and Falklands. During the non-breeding season, it frequents sub-tropical waters and it feeds by plucking food off the ocean surface where it may occur (TSSC, 2015c).

The fairy tern, listed as vulnerable, occurs along the coasts of Victoria, Tasmania, South Australia and Western Australia. Only a few pairs are estimated to exist in Victoria. Breeding occurs on sandy islands and beaches inside estuaries. The open nature of the nesting sites makes them vulnerable to disturbance by human activities. The species predates on small, bait sized fish (DAWE, 2022b).

Table 5-11 EPBC Act-listed bird species in the Operational Areas

Scientific name	Common name	Threatened species	Migratory species	Listed marine species	BIA
Albatross					
Diomedia antipodensis	Antipodean albatross	V	✓ (M)	✓	-
Diomedia gibsoni	Gibson’s albatross	V		✓	-
Diomedia epomophora	Southern royal albatross	V	✓ (M)	✓	-
Diomedia exulans	Wandering albatross	V	✓ (M)	✓	FKO
Diomedia sanfordi	Northern royal albatross	E	✓ (M)	✓	-
Thalassarche bulleri platei	Pacific albatross	V	-	✓	-
Thalassarche bulleri	Buller’s albatross	V	✓ (M)	✓	FKO
Thalassarche carteri	Indian yellow-nosed albatross	E	✓ (M)	✓	FKO
Thalassarche cauta	Shy albatross	V	✓ (M)	✓	fLO
Thalassarche chrysostoma	Grey-headed albatross	E	✓ (M)	✓	-
Thalassarche eremita	Chatham albatross	E	✓ (M)	✓	Listed for all OAs except for WTA and BMA

Scientific name	Common name	Threatened species	Migratory species	Listed marine species	BIA
Thalassarche impavida	Campbell albatross	V	✓ (M)	✓	FKO
Thalassarche melanophris	Black-browed albatross	V	✓ (M)	✓	FKO
Thalassarche salvini	Salvin's albatross	V	✓ (M)	✓	-
Thalassarche steadi	White-capped albatross	V	✓ (M)	✓	-
Petrels					
Fregetta grallaria	White-bellied storm petrel	V	-	-	-
Halobaena caerulea	Blue petrel	V	-	-	-
Macronectes giganteus	Southern giant petrel	E	✓ (M)	✓	-
Macronectes halli	Northern giant petrel	V	✓ (M)	✓	-
Pelecanoides urinatrix	Common diving petrel	-	-	✓	FKO
Pterodroma leucoptera	Gould's petrel	E	-	-	-
Scolopacidae -Sandpipers					
Actitis hypoleucos	Common sandpiper	-	✓ (W)	✓	-
Calidris acuminata	Sharp-tailed sandpiper	-	✓ (W)	✓	-
Calidris ferruginea	Curlew sandpiper	CE	✓ (W)	✓	-
Calidris melanotos	Pectoral sandpiper	-	✓ (W)	✓	-
Other scolopacidae					
Calidris canutus	Red knot	E	✓ (W)	✓	-
Numenius madagascariensis	Eastern curlew	CE	✓ (W)	✓	-
Shearwaters					
Ardenna carneipes aka *Puffinus carneipes*	Flesh-footed shearwater	-	✓ (M)	✓	-

Scientific name	Common name	Threatened species	Migratory species	Listed marine species	BIA
Ardenna grisea aka Puffinus griseus	Sooty shearwater	-	✓ (M)	✓	-
Ardenna tenuirostris aka *Puffinus tenuirostris*	Short-tailed shearwater	-	✓ (M)	✓	F listed for all OAs except for WTA
Terns					
Sternula nereis	Fairy tern	V	-	-	-
Others					
Catharacta skua	Great skua	-	-	✓	-
Pachyptila turtur	Fairy prion	-	-	✓	-
Pachyptila turtur subantartica	Fairy prion (southern)	V	-	-	-
Threatened species: V Vulnerable E Endangered CE Critically	Endangered migratory species: M Marine W Wetland	Type of BIA: FLO Foraging, feeding or related behaviour likely to occur within the area FKO Foraging, feeding or related behaviour known to occur within the area F Foraging			

Note: Species highlighted in blue text occur in the OAs indicated in the last column.

Table 5-12 Key threats and management actions for seabird and shorebird threatened species or species habitat that may occur within the Operational Areas

Common name	Conservation Advice or Recovery Plan	Key threats (relevant to petroleum activities)	Relevant to activities in this EP
Antipodean albatross	*National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016* (DSEWPC, 2011a)	Marine pollution, including marine debris.	N/A
Southern royal albatross			
Gibson's albatross			
Northern royal albatross			
Buller's albatross			

Common name	Conservation Advice or Recovery Plan	Key threats (relevant to petroleum activities)	Relevant to activities in this EP
Pacific albatross			
Shy albatross			
Chatham albatross			
Campbell albatross			
Black-browed albatross			
Salvin's albatross			
White-capped albatross			
Grey-headed albatross	*National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016* (DSEWPC, 2011a) *Approved Conservation Advice for Thalassarche chrysostoma (Grey-headed Albatross)* (DEWHA, 2009a)	Marine pollution, including marine debris.	N
White-bellied storm petrel	*Lord Howe Island Biodiversity Management Plan* (Department of Environment and Climate Change, 2008)	None identified.	-
Blue petrel	*Conservation Advice Halobaena caerulea (Blue Petrel)* (TSSC, 2015d)	None identified.	-
Southern giant petrel	*National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016* (DSEWPC, 2011a)	Marine pollution, including marine debris.	N/A
Northern giant petrel			

Common name	Conservation Advice or Recovery Plan	Key threats (relevant to petroleum activities)	Relevant to activities in this EP
Gould's petrel	*Gould's Petrel (Pterodroma leucoptera leucoptera) Recovery Plan* (Department of Environment and Conservation, 2006)	Oil spills Note: Oil spills in the vicinity Cabbage Tree Island (main breeding population in New South Wales) are not considered a threat because the Gould's petrel does not feed in coastal waters however, oceanic oil spills may pose some risk as birds feed in oceanic waters.	N/A
Curlew sandpiper	*Conservation Advice Calidris ferruginea (Curlew Sandpiper)* (Department of the Environment, 2015b)	• Habitat loss and degradation from pollution (coastal bays and inlets, coastal wetlands). • Environmental pollution.	N/A
Fairy tern	*Approved Conservation Advice for Sternula nereis (Fairy Tern)* (DSEWPC, 2011b)	Oil spills, particularly in Victoria, where the close proximity of oil facilities poses a risk of oil spills that may affect the species' breeding habitat.	N/A
Australasian Bittern	*Conservation Advice Botaurus poiciloptilus (Australasian Bittern)* (TSSC, 2019)	Habitat loss and degradation (Habitat mainly in freshwater wetlands and, rarely, in estuaries or tidal wetlands).	N/A
Red Knot	*Conservation Advice Calidris canutus (Red Knot)* (TSSC, 2016)	• Habitat loss (along the coast and mudflats) and degradation from environmental pollution. • Pollution or contamination impacts at breeding sites (not in Australia) and enroute during migration.	N/A

Common name	Conservation Advice or Recovery Plan	Key threats (relevant to petroleum activities)	Relevant to activities in this EP
Red knot, great knot, bar-tailed godwit, greater sand plover	*Wildlife Conservation Plan for Migratory Shorebirds* (Department of the Environment, 2015c)	• Habitat loss and degradation from environmental pollution (wetlands are key habitats). • Pollution or contamination impacts (to wetlands).	N/A
Eastern curlew	*Conservation Advice Numenius madagascariensis (Eastern Curlew)* (Department of the Environment, 2015d)	• Habitat loss and degradation from pollution (sheltered coasts, especially estuaries, bays with large intertidal mudflats or sandflats. • Environmental pollution.	N/A
Fairy prion (southern)	*Conservation Advice Pachyptila turtur subantartica (Fairy Prion (Southern))* (TSSC, 2015e)	None identified.	N/A

5.5.1.3 Marine mammals

5.5.1.3.1 Whales

All whale species that may occur in the OAs are listed in Table 5-13. However not all may occur uniformly across the region. The species shown in blue font may only occur in deeper waters as they are considered to be oceanic species and are seldom seen over the shallower, continental shelf. Table 5-14 lists the key threats and management actions for threatened marine mammal species or species habitat that may occur within the OAs.

Table 5-13 Marine mammal species or species habitat that may occur within the Operational Areas

Scientific name	Common name	Threatened species	Migratory species	Listed marine species	BIA
Cetaceans - Whales					
Balaenoptera acutorostrata	Minke whale	-	-	-	-
Balaenoptera bonaerensis	Antarctic minke whale	-	✓	-	-
Balaenoptera borealis	Sei whale	V	✓	-	-

Scientific name	Common name	Threatened species	Migratory species	Listed marine species	BIA
Balaenoptera edeni	Bryde's whale	-	✓	-	-
Balaenoptera musculus	Blue whale, pygmy	E	✓	-	FLO
Balaenoptera physalus	Fin whale	V	✓	-	-
Berardius arnuxii	Arnoux's beaked whale	-	-	-	-
Caperea marginata	Pygmy right whale	-	✓	-	-
Eubalaena australis	Southern right whale	E	✓	-	KCR
Globicephala macrorhynchus	Short-finned pilot whale	-	-	-	-
Globicephala melas	Long-finned pilot whale	-	-	-	-
Kogia breviceps	Pygmy sperm whale	-	-	-	-
Kogia simus	Dwarf sperm whale	-	-	-	-
Megaptera novaeangliae	Humpback whale	V	✓	-	-
Mesoplodon bowdoini	Andrew's beaked whale	-	-	-	-
Mesoplodon densirostris	Blainville's beaked whale	-	-	-	-
Mesoplodon hectori	Hector's beaked whale	-	-	-	-
Mesoplodon layardii	Strap-toothed beaked whale	-	-	-	-
Mesoplodon mirus	True's Beaked whale	-	-	-	-
Physeter microcephalus	Sperm whale	-	✓	-	-
Ziphius cavirostris	Cuvier's beaked whale	-	-	-	-
Cetaceans – Dolphins					
Delphinus delphis	Common dolphin	-	-	-	-
Grampus griseus	Risso's dolphin	-	-	-	-
Lagenorhynchus obscurus	Dusky dolphin	-	✓	-	-
Lissodelphiss peronii	Southern right whale dolphin	-	-	-	-

Scientific name	Common name	Threatened species	Migratory species	Listed marine species	BIA
Orcinus orca	Killer whale	-	✓	-	-
Pseudorca crassidens	False killer whale	-	-	-	-
Tursiops truncatus s. str.	Bottlenose dolphin	-	-	-	-
Pinnipeds					
Arctocephalus forsteri	New Zealand fur seal	-	-	✓	-
Arctocephalus pusillus	Australian fur seal	-	-	✓	-
Threatened species: V Vulnerable E Endangered	Type of BIA: KCR Known core range. FLO Foraging, feeding or related behaviour likely to occur within the area				

Note: Species shown in blue font may only occur in deeper waters as they are considered to be oceanic species and are seldom seen over the shallower, continental shelf.

Table 5-14 Key threats and management actions for threatened marine mammal species or species habitat that may occur within the Operational Areas

Common name	Conservation Advice or Recovery Plan	Key threats (relevant to petroleum activities)	Relevant to activities in this EP
Sei whale	*Conservation Advice Balaenoptera borealis (Sei Whale)* (TSSC, 2015f)	• Anthropogenic noise and acoustic disturbance. • Habitat degradation including pollution. • Pollution (persistent toxic pollutants). • Vessel strike.	Section 8
Blue whale	*Conservation Management Plan for the Blue Whale 2015-2025* (DoEE, 2015c)	• Noise interference. • Habitat modification from marine debris or acute and chronic chemical discharge, including pollutants that undergo bioaccumulation. • Vessel disturbance (collision and behaviour change).	Section 8
Fin whale	*Conservation Advice Balaenoptera physalus (Fin Whale)* (TSSC, 2015g)	• Anthropogenic noise and acoustic disturbance.	N/A

Common name	Conservation Advice or Recovery Plan	Key threats (relevant to petroleum activities)	Relevant to activities in this EP
		• Pollution (persistent toxic pollutants). • Vessel strike.	
Southern right whale	*Conservation Management Plan for the Southern Right Whale 2011-2021* (DSEWPC, 2012b)	• Entanglement. • Vessel strike. • Noise Interference. • Habitat modification (acute chemical discharge, e.g. from spills).	N/A
Humpback whale	*Approved Conservation Advice for Megaptera novaeangliae (Humpback Whale*) (TSSC, 2015h)	• Noise interference. • Habitat degradation (primarily through coastal development and pollution). • Entanglement (including marine debris ingestion). • Vessel disturbance and strike.	N/A

The OAs in the east are located closer to the edge of the Bass Canyon where the continental shelf drops off into deeper waters, therefore there is a possibility that these oceanic species may occur in these OAs (HLA, FTA, CBA, MKA, KFB and FLA). These oceanic species are made up of the beaked whales from the Ziphiidae family, the sperm whale (*Physeter macrocephalus*), the pygmy sperm whale (*Kogia breviceps*) and the dwarf sperm whale (*Kogia sima*). None of these species have known BIAs overlapping the OAs.

Beaked whales make up a quarter of all existing cetacean species, making them the second largest cetacean family after the delphinids. Their distinguishing feature is the presence of a snout or beak and their overall profile is reminiscent of dolphins. The family represents a monophyletic group, which means that all species in the group descend from a single ancestor. Like other odontocetes, beaked whales use echolocation to orientate themselves and locate their prey in the deep dark ocean water. This family has a specialised foraging strategy called suction feeding. By creating a strong pressure-gradient, using their tongue bone (hyoid bone) and v-shaped food groves, they create a vacuum in their mouth which enables them to suck in their prey and swallow it whole (NAMMCO, 2022). The family is thought to be abundant throughout their range, although there are few surveys available to provide current population estimates for the different species. No known BIAs for the beaked whales occur within the OAs.

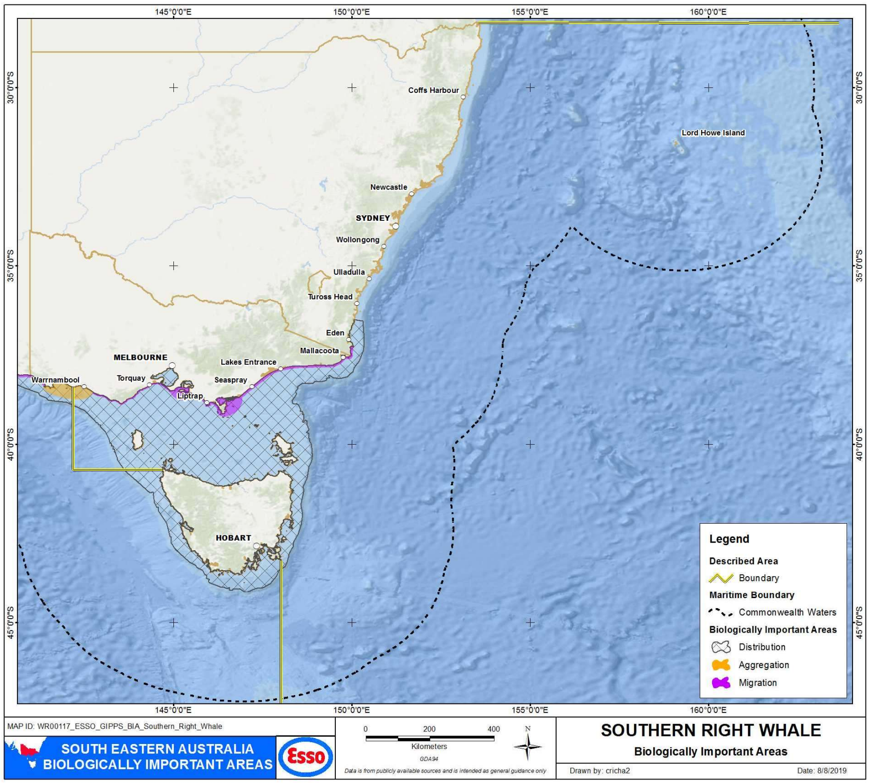
Of the species that may occur across all the OAs there are two species that are listed as endangered and three that are vulnerable.

Southern right whales are listed as endangered and generally occur along the southern coast of Australia, they migrate annually along the eastern coastline from high latitude feeding grounds to lower latitudes for calving between mid-May and September (DoEE, 2017c).

Known calving and aggregation grounds in the south-east region are Warrnambool, Port Fairy, Port Campbell and Portland in Victoria, and Encounter Bay in South Australia (DSEWPC, 2012b) (Department of the Environment, 2015a)). Nursery grounds are occupied from May to October, with female calf pairs generally staying in the area for two to three months (Charlton, 2017). Calving itself usually occurs in very shallow (<10 metres depth) waters. Other population classes stay in the nursery grounds for shorter and variable periods of time; there is typically a lot of movement along the coast, and thus habitat connectivity is important for this species. A known BIA identified as a known core range in Table 5-13, is the corridor where the whales migrate between nursery grounds and occurs in shallower waters, generally <20 metres water depth along the Victorian coastline inshore of the OAs. This corridor is used during the May to October period (DSEWPC, 2012b). Refer to Figure 5-22. The summer offshore distribution and migration routes of Southern right whales largely is unknown but is known to include directly southern and western migration pathways, but may include offshore habitat where mating occurs (Mackay, et al., 2015).

The blue whale has two subspecies, one of which occurs within OAs, the pygmy blue whale (*Balaenoptera musculus brevicauda*). Pygmy blue whales are listed as endangered and have the highest known prey requirements, consuming up to two tonnes of krill per day (DoEE, 2015c).

Blue whale sightings in Australia are widespread, and much of the continental shelf and coastal waters are unlikely to hold significance for this species with the exception of some foraging locations. The pygmy blue whale foraging BIA extends from Eden on the south coast of New South Wales, down around the southern coast of Tasmania and extends around the western coast of Victoria to South Australia and the western part of the Great Australian Bight, as shown in Figure 5-23 (DoEE, 2015c). This includes all the waters between Tasmania and the mainland. The primary areas for feeding are associated with surface swarms of coastal krill that form in response to the upwelling of nutrient rich, cool water. Known as the Bonney coast upwelling, this event occurs from the west of Bass Strait and extends to the Great Australian Bight (Department of the Environment, 2015a). The main timing for this is from November to December. From feeding at the Great Australian Bight, the pygmy blue whales move south-east to the Bonney coast upwelling system off eastern South Australia, western Victoria and Tasmania. This occurs predominately between January to April, although the within-season distribution trends in Bass Strait are unknown (Department of the Environment, 2015a). In addition, feeding in Bass Strait is more likely to take place in the high productivity areas where upwelling events can occur such as the edges of the continental shelf (Bass Cascade) or at the Big Horseshoe Canyon (refer to Section 5.4.5).



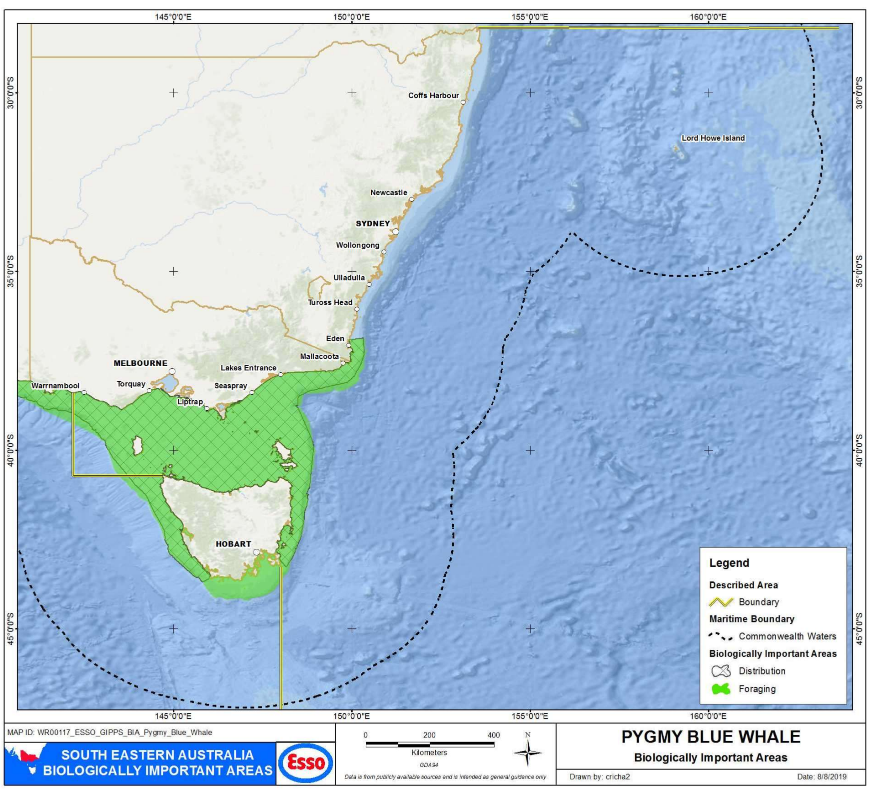


Figure 5-22 Biologically Important Areas for whale species

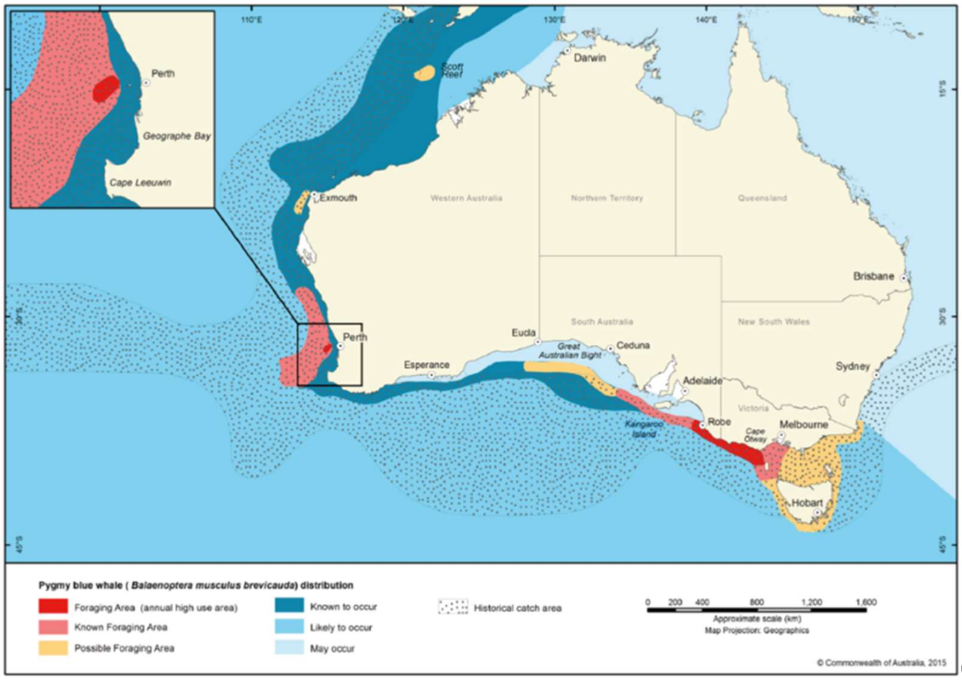


Figure 5-23 Distribution and foraging areas for the pygmy blue whale

Sei whales are listed as vulnerable and have been infrequently recorded in Australian waters; however occasional sightings have been recorded off Tasmania, New South Wales, Queensland and within the Great Australian Bight (DoEE, 2018). Sei whales typically feed between the Antarctic and subtropical convergences, and their diet is planktonic crustacea, in particular copepods and amphipods. However, Sei whales have also been observed feeding on the continental shelf in the Bonney coast upwelling region during November and May, suggesting the area may be used for opportunistic feeding (DoEE, 2018).

The distribution of Fin whales in Australian waters is uncertain, but they have been recorded in Commonwealth waters off most States (the species is rarely found in inshore waters) (DoEE, 2017d). Fin whales frequently lunge or skim feed, at or near the surface, feeding on planktonic crustacea, some fish and cephalopods (DoEE, 2017d). Fin whales generally feed in high latitudes, however depending upon prey availability and locality, may also feed in lower latitudes. Fin whales have been observed in waters off the Bonney coast upwelling during November and May and detected acoustically south of Portland, Victoria (Erbe, McCauley, Gavrilov, Madhusudhana, & Verma, 2016), both areas well away from the OAs.

Humpback whales are listed as vulnerable and migrate annually along the eastern coast of Australia heading north to tropical calving grounds from June to August, and south to Southern Ocean feeding areas from September to November, as shown in Figure 5-24 (TSSC, 2015h). While the main migration route of this species is along the east coast of Australia along the continental shelf to the east of Bass Strait, some animals migrate through Bass Strait. Humpback whales do not feed, breed or rest in Bass Strait and the Victorian coastal waters are not a key location for this whale species (Bannister, Kemper, & Warneke, 1996). Most feeding grounds are south of Australian waters (TSSC, 2015h). There are no BIAs identified for the Humpback whale around the OAs. Humpback whales in the southern hemisphere primarily feed on Antarctic krill (*Euphausia superba*). While most feeding grounds are south of Australian waters, there are some feeding grounds that are regularly used on the southern migration in Australian coastal waters: off the coast of Eden in New South Wales, and east coast of Tasmania (TSSC, 2015h).

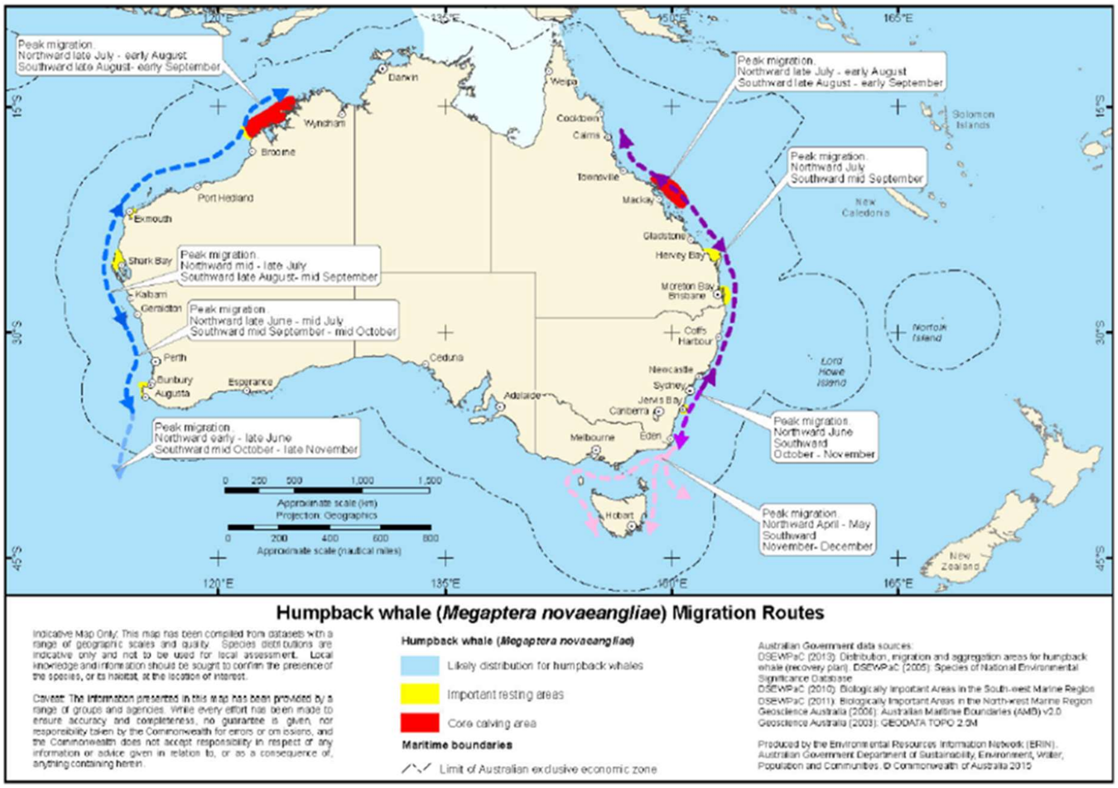


Figure 5-24 Migration routes for humpback whales around Australia

5.5.1.3.2 Dolphins

All dolphins are a protected species in Australian waters. None that are listed as occurring in the OAs are listed as vulnerable, endangered or critically endangered. They are found in a variety of marine habitats, from the open ocean to coastal bays and inlets. Dolphins are migratory animals and their habits vary. Species that live in coastal areas are less likely to travel compared to species that live in open water.

The bottle-nosed dolphin (*Tursiops truncates*) and the common dolphin (*Delphinus delphis*) are commonly sighted in near-shore Victorian waters.

Dusky dolphins are listed as a migratory marine species likely to be present in the vicinity of the OAs. Although they have been sighted off Tasmania, there is no known calving locality for this species in Australian waters (Gill, Ross, Dawbin, & Wapstra, 2000).

Killer whales are the largest member of the dolphin family and are recognisable by their distinctive black, white and grey coloration. The area of occupancy of killer whales, in Australia, is likely to be greater than 2000 square kilometres. No key localities are known for killer whales within continental Australian waters, however, all populations are considered important for the species' long-term survival. The habitat of killer whales is difficult to categorise due to the cosmopolitan nature of the species and its ability to inhabit all oceans (DAWE, 2022c). False killer whales (*Pseudorca crassidens)* are thought to have a similar range to the killer whale. Although skull morphology in this species is similar to that of killer whales, false killer whales are genetically more similar to Risso's dolphin (*Grampus griseus*), pygmy killer whales (*Feresa attenuate*), short-finned pilot whale (*Globicephala macrorhynchus*) and long-finned pilot whale (*Globicephala melas*). They have a long slender body, a rounded overhanging forehead and no beak. The area of occupancy of false killer whales cannot be calculated due to the paucity of records for Australia. Recordings in Australia have occurred widely through strandings in all states (DAWE, 2022d).

5.5.1.3.3 Pinnipeds – seals

Pinnipeds are a widely distributed and diverse group or carnivorous, fin-footed, semi-aquatic marine mammals. Both species that may occur in the OAs are from the Otariidae family i.e. the eared seals, such as sea lions and fur seals and are both listed marine species.

There are 10 established breeding colonies of the Australian fur seal, which are restricted to islands in the Bass Strait; six occurring off the coast of Victoria and four off the coast of Tasmania (Kirkwood, et al., 2010) (Pemberton & Kirkwood, 1994) (Warneke, 1995). Australian fur seals breed during the summer months, with pups born from late October to late December. The closest colonies of the Australian fur seal are located at Gabo Island, Kanowna Island (off Wilsons Promontory) and The Skerries, which is home to a major Australian fur seal breeding colony with an estimated population of 11,500, representing approximately 12 percent of the national population. Between feeding trips seals return to land to rest, for example at the resting site at Cape Conran.

Satellite tracking of seals from both Kanowna Island and The Skerries, and reports from offshore platforms within the Gippsland Basin near the shore show that Australian fur seals commonly occur in the vicinity of these facilities (Arnould & Kirkwood, 2008) and commonly rest on the Esso facilities.

The New Zealand fur seal (long-nosed fur seal) and the Australian fur seal have the widest range of the pinnipeds, occurring in coastal regions from South Australia through to New South Wales. While breeding for the New Zealand fur seal does occur along the coasts of Victoria and southern Tasmania, as shown in Figure 5-25 (Kirkwood, et al., 2010), the main breeding sites (accounting for over 80 percent of the national population) are located further east in Western and South Australia (TSSC, 2017) (Kirkwood, et al., 2010) (DSEWPC, 2012c). Conversely, Figure 5-26 (Phillip Island Nature Parks, 2019), shows that the main breeding locations for the Australian fur seal are typically on islands within Bass Strait (DoEE, 2017e) (Kirkwood, et al., 2010). New Zealand fur seal breeding colonies are typically found in rocky habitat with jumbled boulders; Australian fur seal prefer flatter rocky shelves (Shaughnessy, 1999). Colonies for both species are typically occupied year-round, with greater activity during breeding seasons (Shaughnessy, 1999) (DoEE, 2017e). Numbers of Australian fur seals on Montague Island (New South Wales), fluctuate through the year, with peak numbers occurring in September and October; this reflects the northward migration over the winter, and the subsequent return to the breeding colonies of the Bass Strait in late spring (DoEE, 2017e). The Australian and New Zealand fur seals have been recorded using Beware Reef as a haul-out site (Parks Victoria, 2017b).

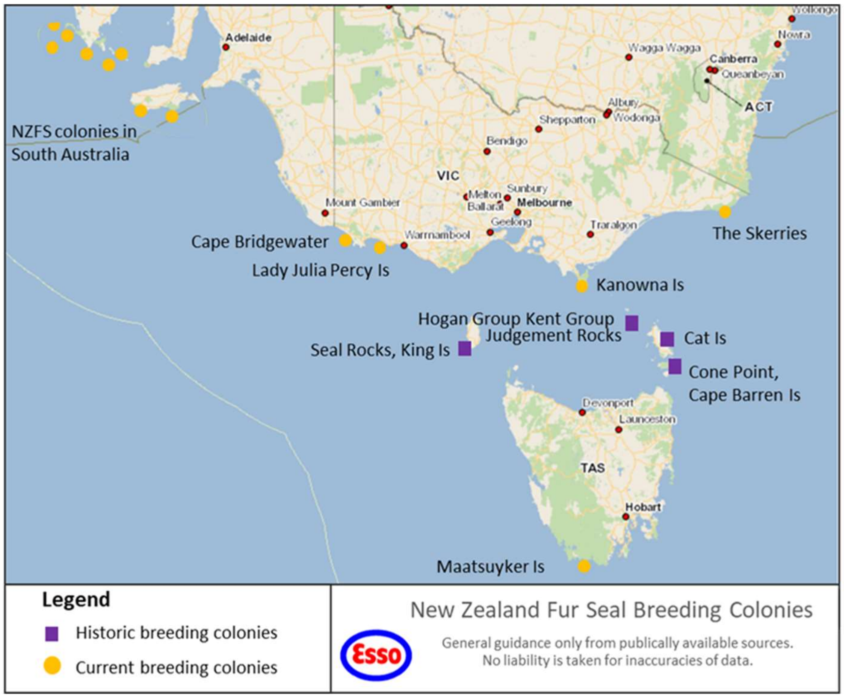


Figure 5-25 Historic (square icon) and current (circle icon) breeding colonies for the New Zealand fur seal

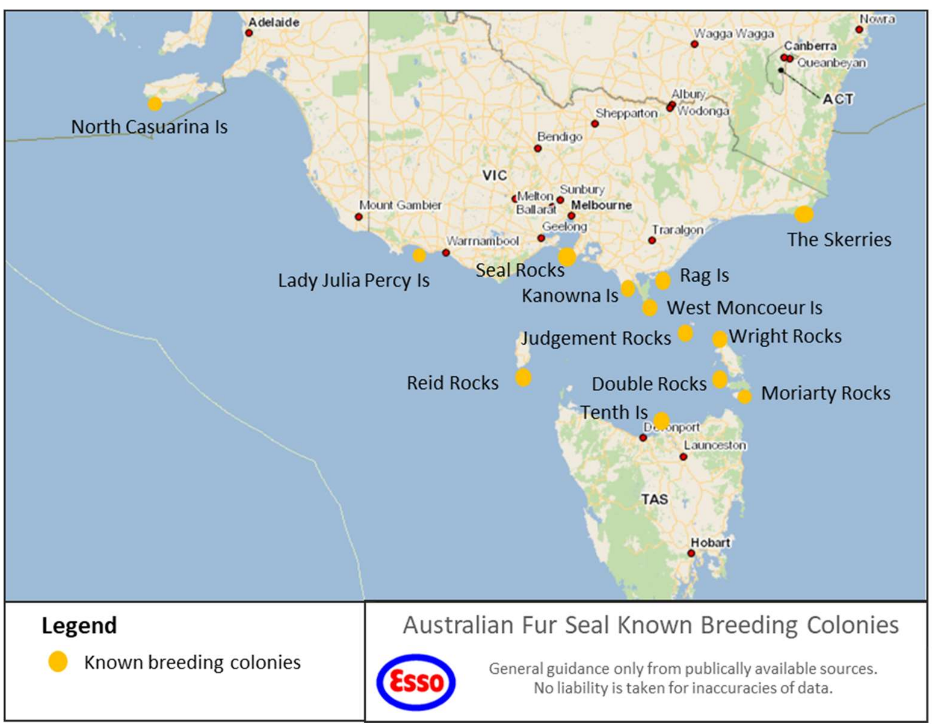


Figure 5-26 Known breeding colonies for the Australian fur seal

5.5.1.4 Marine reptiles – turtles

There are two turtle species that are likely to occur in the OAs of the Campaign #1 SPJs, these are the leatherback turtle (*Dermochelys coriacea*) and the loggerhead turtle (*Caretta caretta)* species. The only other turtle which may occur is the Green turtle (*Chelonia mydas)* as shown in Table 5-15. Table 5-16 lists the key threats and management actions for threatened marine reptile species or species habitat that may occur within the OA.

The loggerhead turtle has a global distribution throughout tropical, sub-tropical and temperate waters; and in Australia typically occurs in the waters of coral and rocky reefs, seagrass beds, or muddy bays throughout eastern, northern and western Australia (DoEE, 2017f). Loggerhead turtles are carnivorous, feeding primarily on benthic invertebrates. While the species has a broad foraging range throughout Australian waters, nesting is known to occur (from two different genetic stocks) on sandy beaches on the central western and eastern coasts (Figure 5-27) (DoEE, 2017f). The eastern Australian population is smaller than the western Australian population; and has also undergone a decline from approximately 3500 nesting females in 1977, to approximately 500 nesting females in 2000 (DoEE, 2017f). No nesting or inter-nesting critical habitat, or BIAs, have been identified for the loggerhead turtle near the OAs.

The leatherback turtle has the widest distribution of any marine turtle, occurring in tropical to sub-polar oceans (TSSC, 2008). In Australia, the leatherback turtle has been recorded foraging in all Australian states, but no large nesting populations have been recorded (Figure 5-27) (TSSC, 2008). The leatherback turtle is a highly pelagic species, venturing close to shore mainly during the nesting season (DoEE, 2017g). Adults feed mainly on pelagic soft-bodied creatures such as jellyfish, tunicates, salps, squid (DoEE, 2017g). No nesting or inter-nesting critical habitat, or BIAs, have been identified for the leatherback turtle near the OAs.

Green turtles are found in tropical and subtropical waters throughout the world; usually occurring within the 20 degrees Celsius isotherms, although individuals can stray into temperate waters (DoEE, 2017h). Within Australia, green turtles typically nest, forage and migrate across tropical northern Australia (Figure 5-27) (DoEE, 2017h). No nesting or inter-nesting critical habitat, or BIAs, have been identified for the green turtle within the OAs. The total Australian population of green turtles is approximately 70,000 individuals, with approximately 8000 of these found in the Southern Great Barrier Reef area. Adult green turtles consume mainly seagrass and algae, although they will occasionally eat mangroves, fish-egg cases, jellyfish, and sponges; juvenile green turtles are typically more carnivorous, and will also consume plankton during their pelagic stage (DoEE, 2017h).

Table 5-15 EPBC Act-listed turtle species in the Operational Areas

Scientific name	Common name	Threatened species	Migratory species	Listed marine species
Caretta caretta	Loggerhead turtle	E	✓	✓
Chelonia mydas	Green turtle	V	✓	✓
Dermochelys coriacea	Leatherback turtle	E	✓	✓

Table 5-16 Key threats and management actions for threatened marine reptile species or species habitat that may occur within the Operational Areas

<table>
<tr><th>Common name</th><th>Conservation Advice or Recovery Plan</th><th>Key threats (relevant to petroleum activities)</th><th>Relevant to activities in this EP</th></tr>
<tr><td>Loggerhead turtle</td><td rowspan="2">Recovery Plan for Marine Turtles in Australia, 2017-2027 (DoEE, 2017i)</td><td rowspan="3">Marine debris.
Acute and Chronic Chemical discharge (chronic for leather back nesting only).
Light pollution.
Habitat modification.
Vessel disturbance.
Noise interference.</td><td rowspan="2">N/A</td></tr>
<tr><td>Green turtle</td></tr>
<tr><td>Leatherback turtle</td><td>Recovery Plan for Marine Turtles in Australia, 2017-2027 (DoEE, 2017i)

Approved Conservation Advice for Dermochelys coriacea (Leatherback Turtle) (TSSC, 2008)</td><td>N/A</td></tr>
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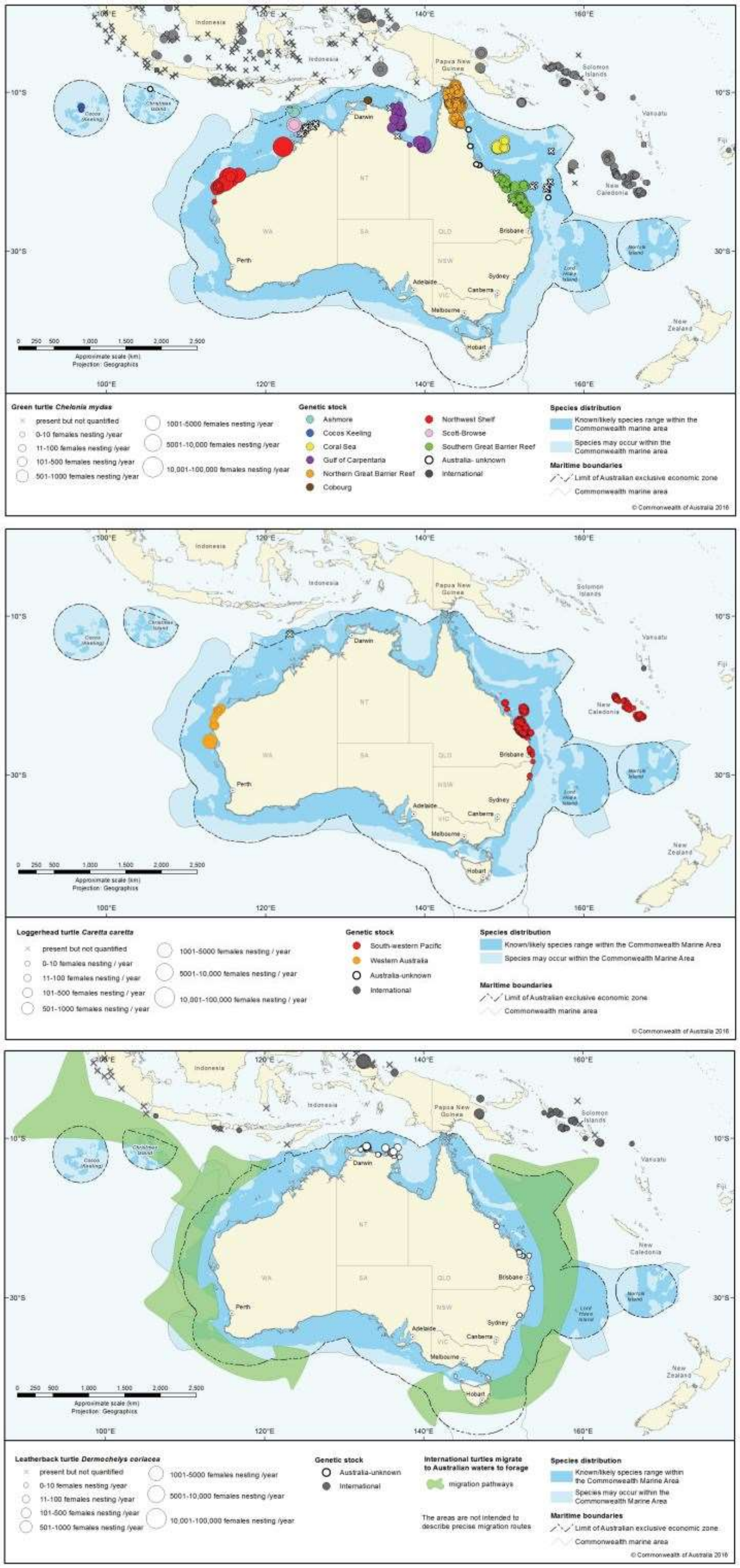


Figure 5-27 Marine turtle species distribution and nesting sites

5.5.2 Plankton species

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

Phytoplankton are autotrophic planktonic organisms living within the photic zone that spend either part or all of their lifecycle drifting with the ocean currents. They are the start of the food chain in the ocean (McClatchie, Middleton, Pattiaratchi, Currie, & Kendrick, 2006). Phytoplankton communities are largely comprised of protists, including green algae, diatoms, and dinoflagellates (McClatchie, Middleton, Pattiaratchi, Currie, & Kendrick, 2006). There are three size classes of phytoplankton: microplankton (20-200µm), nanoplankton (2-20µm) and picoplankton (0.2-2µm). Diatoms and dinoflagellates are the most abundant of the micro and nanoplankton size classes, and are generally responsible for the majority of oceanic primary production (McClatchie, Middleton, Pattiaratchi, Currie, & Kendrick, 2006). Phytoplankton are dependent on oceanographic processes (e.g. currents and vertical mixing), that supply nutrients needed for photosynthesis. Thus, phytoplankton biomass is typically variable (spatially and temporally), but greatest in areas of upwelling, or in shallow waters where nutrient levels are high.

Phytoplankton biomass ranges across Bass Strait (integrated over 0-100 metres depth), from about 1.6µg/L from shallow to 0.1µg/L in deeper waters (Gibbs, Arnott, Longmore, & Marchant, 1991). Phytoplankton biomass rapidly drops off with water depth, to about 0.1µg/L below 100 metres, due to diminishing light penetration.

Zooplankton is the faunal component of plankton, comprised of small protozoa, crustaceans (such as krill) and the eggs and larvae from larger animals. More than 170 species of zooplankton have been recorded in eastern and central Bass Strait, but it has been found that seven dominant species make up 80 percent of individuals (Esso, 2009). Zooplankton biomass is higher in shallow waters of Bass Strait (16.1mg/m^3 dry weight off Mallacoota and 15.5mg/m^3 off Seaspray), dropping to between 1.2-$^-$2.1 mg/m^3 further offshore (integrated over the top 50 metres of the water column), near the deepest regions of Bass Strait (Gibbs, Arnott, Longmore, & Marchant, 1991). As with phytoplankton, zooplankton biomass appears to be higher in the shallow waters of the shelf. Copepods dominate the species encountered (Watson & Chaloupka, 1982).

5.5.3 Benthic habitat

Sediment analysis from the seabed around eight of the platforms in Esso's Bass Strait operations during the Environmental Survey 1 (Summer) provides a profile of the infaunal species in the area in the first quarter of 2021. Samples were taken from around HLA, CBA, KFA, FLA, WTA, BMB, BTA and DPA, and corresponding reference sites. All but PCA, DPA, BMB and BTA are covered by this EP. The results of this study show that although assemblages differed between sites, these differences were not pronounced. Similarly, the analysis of the reference sites showed that infaunal assemblages did not differ markedly to those at platform sites.

Table 5-17 (AECOM Australia Pty Ltd, 2021) details which species of infauna were typical of each site. For example the reference site being typified by Corophiidae, *Tanaidacea* spp., Ampheliscidae, Hoxocephalidae and *Ostrocoda* spp. FLA, was characterised by abundances of Phoxocephalidae, Platyischnopidae, Lysianassidae, Corophiidae and Oedicerotidae and was the site with the species assemblage most discrete from the other sites. Refer to Appendix G for detail.

Table 5-17 Dominant infauna species at sampled sites

Reference site	BMB	BTA
• Corophiidae • *Tanaidacea* spp. • Ampheliscidae • Hoxocephalidae • *Ostrocoda* spp.	• Amphinomidae • Syllidae • Corophiidae • Dexaminidae • *Tanaidacea* spp.	• Corophiidae • *Tanaidacea* spp. • Syllidae • Paraonidae • Spionidae
CBA	**DPA**	**FLA**
• Syllidae • Corophiidae • Onuphidae • *Tanaidacea* spp. • Lysianassidae	• Corophiidae • *Tanaidacea* spp. • Phoxocephalidae • Dexaminidae • Syllidae	• Phoxocephalidae • Platyischnopidae • Lysianassidae • Corophiidae • Oedicerotidae
HLA	**KFA**	**WTA**
• Onuphidae • Corophiidae • Phoxocephalidae • Syllidae • *Ostrocoda* spp.	• Corophiidae • Ostrocoda spp. • Onuphidae • *Tanaidacea* spp. • Ampheliscidae	• Corophiidae • *Tanaidacea* spp. • Syllidae • Spionidae • Phoxocephalidae

At a more detailed level, statistical analysis of similarity was used to examine the minor differences between the platforms. The analysis showed that the different platforms fell into four approximate groups that contained similar species as listed below (refer Appendix G for detail):

- reference sites and DPA
- BTA, WTA and BMB
- CBA HLA and KFA
- FLA, which had an assemblage of infauna species that was clearly discrete from the other platforms.

The analyses also indicated that Corophiidae were present as typifying species at all platforms and reference sites, with *Tanaidacea* spp. and *Ostrocoda* spp. being common at most sites. Corophiidae, *Tanaidacea* spp. and *Ostrocoda* spp. are all subcategories of small crustaceans. The abundance of these species throughout the sites probably contributed to the relatively limited variation in species assemblages across the whole range of the sites. Even FLA, the site most dissimilar to all the other sites, including reference sites, was still dominated by amphipod crustaceans (Phoxocephalidae, Platyischnopidae, Lysianassidae, Corophiidae, Oedicerotidae) like most of the other sites (AECOM Australia Pty Ltd, 2021).

5.6 Socioeconomic environment

5.6.1 Commercial fishing

Feedback received from relevant persons during the voluntary public comment period undertaken for this EP stated that the 'ecological, social and economic value of the commercial fishing industry needs to be described, assessed and considered in the EP'. This section describes the social and economic value of the commercial fishing industry in the vicinity of the OAs. Potential impacts and risks to the commercial fishing industry as a result of the proposed SPJ end states have been described in Section 8.3 and Section 9.3.

There are 23 commercial fisheries with permits to fish in the vicinity of the OAs, nine Commonwealth managed, and 14 managed by the state of Victoria. Not all of these fisheries are active in the area. In a report written by the SETFIA, all commercial fisheries operating within a defined polygon around the Esso Bass Strait facilities were identified (Figure 5-28). The area covered by the polygon is shown in Figure 4-1 (SETFIA, 2022). This polygon encompasses all the OAs covered by this EP.

Figure 5-29 summarises the fisheries active in the polygon and shows which have been active in the area for the previous 10 years (2011-2020) (SETFIA, 2022).

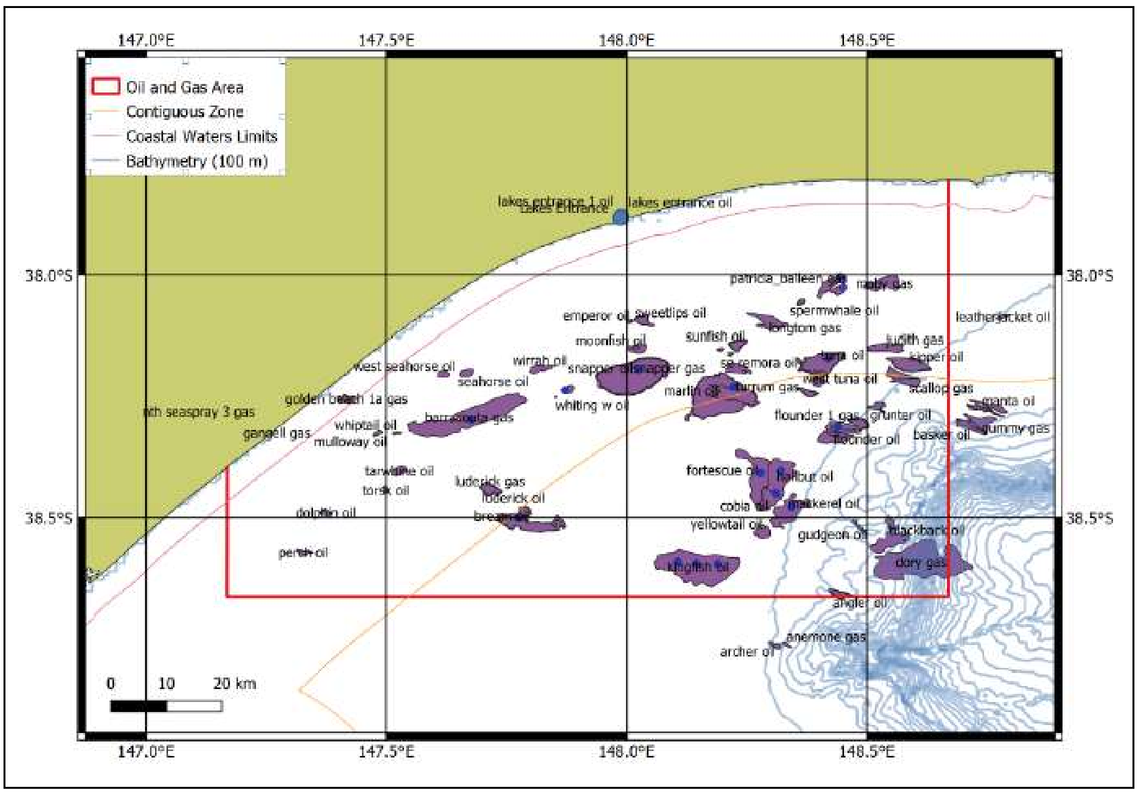


Figure 5-28 The study area (polygon) covered by the SETFIA report, encompassing the Esso Bass Strait facilities

	Commonwealth-managed fisheries	Victorian-managed fisheries
Actively fish	SESSF Commonwealth Trawl sector	Ocean General Fishery
	SESSF Shark Gillnet and Shark Hook sectors	Purse Seine (Ocean) Fishery
	Southern Squid Jig Fishery	Rock Lobster (Eastern Zone) Fishery
	SESSF Scalefish Hook sectors	Scallop (Ocean) Fishery
	Bass Strait Central Zone Scallop Fishery	Trawl (Inshore) Fishery
		Commercial permit*
		Octopus (Eastern Zone) Fishery
		Abalone (Central Zone) Fishery**
		Abalone (Eastern Zone) Fishery**
		Sea Urchin Fishery (Central Zone)**
		Sea Urchin Fishery (Eastern Zone)**
No active fishing	Eastern Tuna and Billfish Fishery	Giant Crab Fishery
	Skipjack Tuna Fishery	Bait (General) Fishery
	Southern Bluefin Tuna Fishery	Wrasse (Ocean) Fishery
	Small Pelagic Fishery	

* Varies from permit to permit.
** Restricted to depths shallower than 25 metres, and so not considered further in this report.

Figure 5-29 Commonwealth and Victorian State-managed fisheries permitted to fish in the polygon

5.6.1.1 Commonwealth managed fisheries

Commercial fishing in south-eastern Australia includes inshore coastal waters, mainly State-administered fisheries, and areas along the continental slope, mainly Commonwealth fisheries.

Commonwealth fisheries are managed by the Australian Fisheries Management Authority, with the fisheries typically operating within 3-200 nautical miles offshore (i.e. to the extent of the Australian Fishing Zone). Fishing intensity for all Australian Government-managed fisheries in 2020 was similar to previous years. Peak catches in waters off the south-east of Australia and in the vicinity of the OAs were principally in the Bass Strait Central Zone Scallop Fishery and the SESSF, as shown in Figure 5-30 (Patterson, et al., 2021). These and the other Commonwealth-managed fisheries that actively fish in the polygon are described in the following sections.

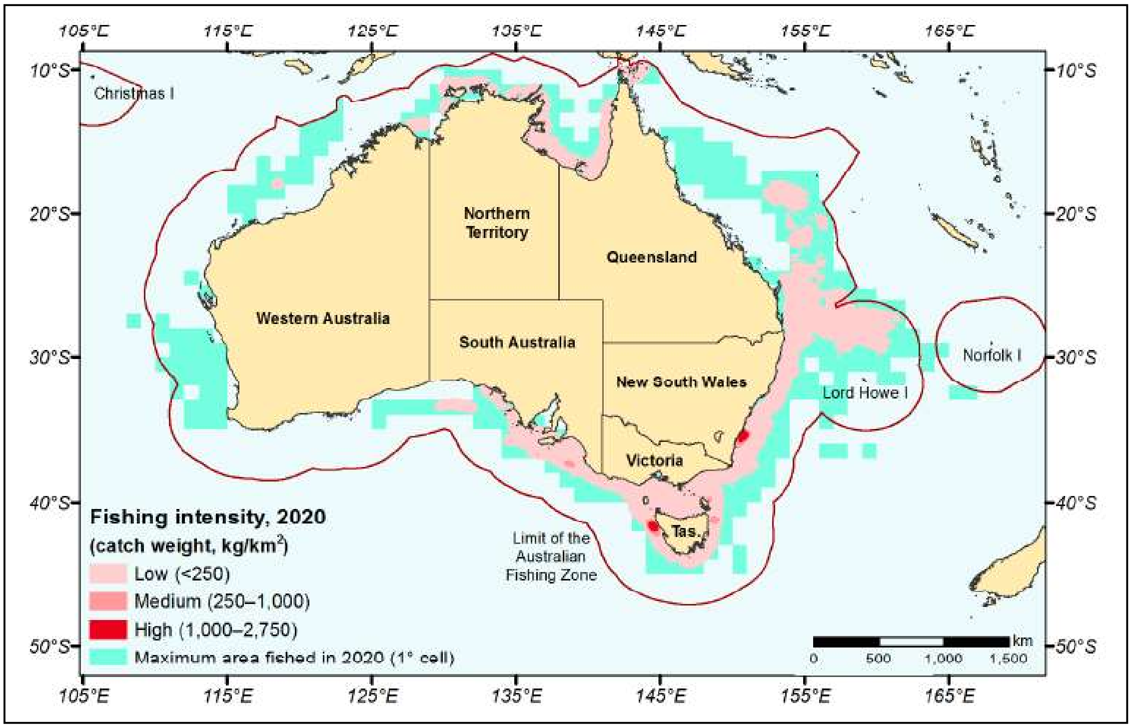


Figure 5-30 Fishing intensity of all Australian Government-managed fisheries in 2020

5.6.1.1.1 Southern and Eastern Scalefish and Shark Fishery

SESFF is a multisector, multigear and multispecies fishery, targeting a variety of fish, squid and shark stock. The area managed by the fishery covers almost half the area of the Australian Fishing Zone, and spans both Commonwealth waters and the waters of several Australian states under Offshore Constitutional Settlement arrangements. For 2019-2020, the gross value of production was $86 million, accounting for 20 percent of the gross value of production for Commonwealth fisheries and making it the largest fishery in terms of volume caught (Patterson, et al., 2021). The primary mechanism for controlling the harvest of stocks in the SESSF is through the allocation of annual total allowable catches (TACs). TACs are determined for all key commercial stocks, along with some secondary or by-product stocks.

The SESSF is split into four sectors, two of which operate in the vicinity of the OAs.

- Commonwealth Trawl Sector (CTS)
- Gillnet, Hook and Trap Sector, this includes the following sub-sectors:
- Scalefish Hook Sector
- Shark Gillnet and Shark Hook Sectors (SGSHS)
- Trap Sector*
- Great Australian Bight Trawl Sector+
- East Coast Deepwater Trawl Sector+

* Not described further due to low historical fishing effort.
+ Fishing management area does not include Bass Strait.

Over 100 species are landed in the SESSF however quotas are only applied to the main species. There are currently 34 species that have allocated TACs. Figure 5-31 (SETFIA, 2022) shows the species with allocated TACs. Those that are likely to be caught in the vicinity of the OAs are shown in bold font (SETFIA, 2022).

Species	TAC (t)	Species	TAC (t)
Alfonsino	1,017	Orange Roughy – (GAB)	50
Bight Redfish (GAB)	893	Orange Roughy – (Cascade)	500
Blue Eye Trevalla	**421**	Orange Roughy – (East)	1,277
Blue Grenadier	**12,183**	Orange Roughy – (South)	96[11]
Blue Warehou	**50**	Orange Roughy – (West)	60
Deepwater Flathead (GAB)	1,128	Oreo (smooth Cascade)	150
Deepwater Shark (east)	**24**	Oreo (smooth other)	90
Deepwater Shark (west)	235	Oreo (basket)	139
Elephant Fish	**114**	**Pink Ling**	**1,121**
Flathead	**2,333**	Redfish	50
Gemfish East	100	**Ribaldo**	**396**
Gemfish West	343	Royal Red Prawn	605
Gummy Shark	**1,672**[12]	**Sawshark**	**509**
Jackass Morwong	**463**	**School Shark**	**194**
John Dory	**60**	**School Whiting**	**917**
Mirror Dory	**144**	**Silver Trevally**	**197**
Ocean Perch	**304**	**Silver Warehou**	**450**

Figure 5-31 List of 2021–2022 total allowable catch for Southern and Eastern Scalefish and Shark Fishery quota species

5.6.1.1.2 Commonwealth Trawl Sector

The CTS predominantly uses demersal otter-board trawl and Danish seine fishing methods. Pair trawling and midwater trawling methods are also permitted under the SESSF management plan but are rarely used (Patterson, et al., 2021).

Figure 5-32 (Patterson, et al., 2021) shows the fishing intensity in the CTS 2020-2021 fishing season for the two dominant fishing methods used in the sector, being otter-board trawl and Danish seine. Figure 5-32 also shows that CTS overlaps the vicinity of the OAs. Figure 5-33 (SETFIA, 2022) shows the main species of fish caught by the dominant fishing methods in the vicinity of the OAs in the CTS.

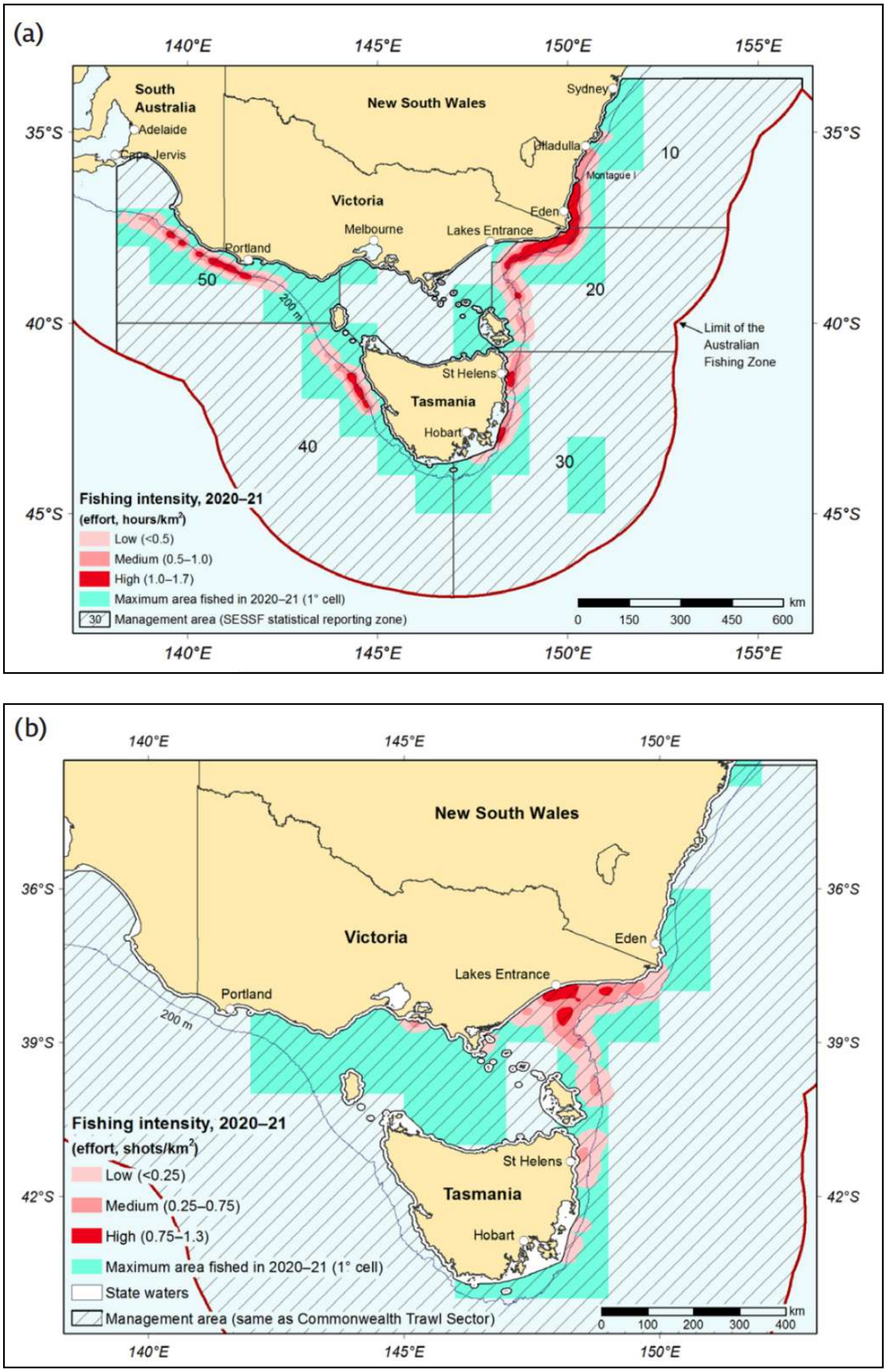


Figure 5-32 Fishing intensity in the Commonwealth Trawl Sector a) otter-board trawl and b) Danish seine, 2020-2021 fishing season

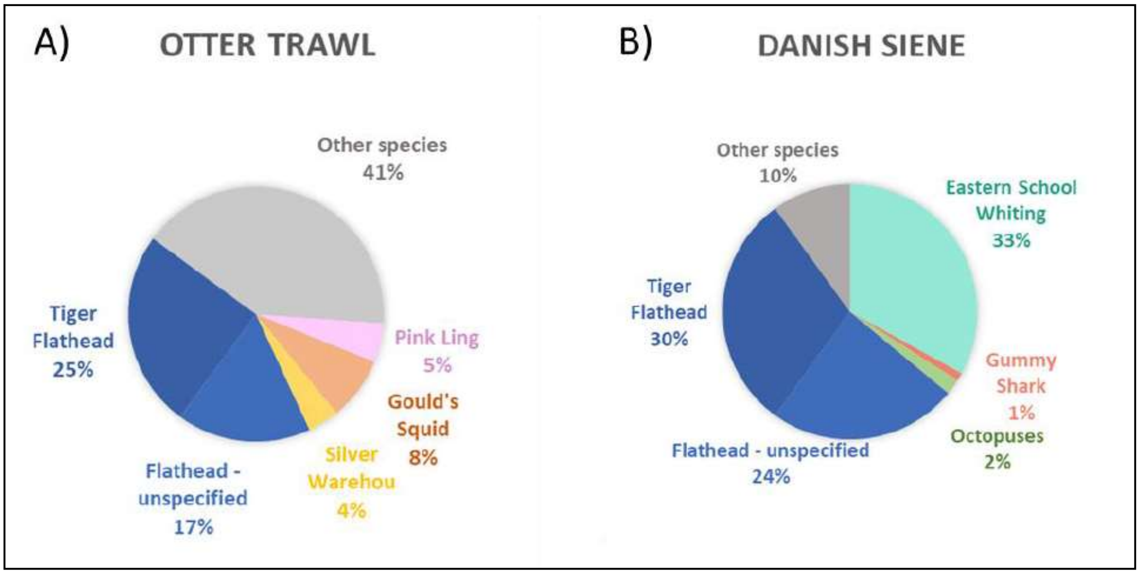


Figure 5-33 Main species caught in the vicinity of the Operational Areas from 2011-2012 to 2020-2021 by a) otter-trawl trawl and b) Danish seine

CTS otter-board trawl vessels reported a total of 4828 fishing events in the polygon from 2011-2012 to 2020-2021 (Table 5-18). Total catch was 1635 tonnes with a value of $7.5 million. Annual fishing effort has decreased over the past 10 years. Annual catch has also decreased over the past 10 years from about 240 tonnes in 2012-2013 to 160 tonnes in 2020-2021 and catch value has followed a similar pattern.

As shown in Table 5-18 (SETFIA, 2022), CTS Danish seine reported a total of 51,044 fishing events in the polygon from 2011-2012 to 2020-2021 (). Total catch was 8934 tonnes with a value of $40.2 million. Annual fishing effort has been relatively stable over the past 10 years. Annual catch value decreased from $5.5 million in 2015-2016 to $2.7 million in 2020-2021 (SETFIA, 2022).

Table 5-18 Commonwealth Trawl Sector fishing effort, catch, value and main target species from polygon from 2011-2012 to 2020-2021

	Otter-board trawl (CTS)	Danish seine
Number of different vessels	23	21
Total shots	4828	51,044
Total catch (t)	1635	8934
Total value	$7,547,111	$40,163,688
Main species caught	• Tiger flathead (25%) • Flatheads (17%) • Gould’s squid (8%)	• Eastern school whiting (33%) • Tiger flathead (30%) • Gummy shark (2%)
Fishing methods used	Otter trawl	Danish seine

5.6.1.1.3 Scalefish Hook Sector

The Scalefish Hook Sector shares many of the same target species as the CTS. This sector uses a variety of longline and dropline hook fishing methods, some of which are automated. The main difference between manual and automatic longline is that for automatic the hooks are baited by a machine rather than by hand (Patterson, et al., 2021). The Scalefish Hook Sector targets pink ling and blue-eye trevalla (*Hyperoglyphe antarctica*) using demersal longlines (including automatic longline) and droplines. The use of automatic longline is restricted to waters deeper than 183 metres (100 fathoms), and so there is no fishing by that method in Bass Strait. This is depicted in Figure 5-34 (Patterson, et al., 2021), which shows the insignificant fishing effort for this sector for the 2020-2021 period.

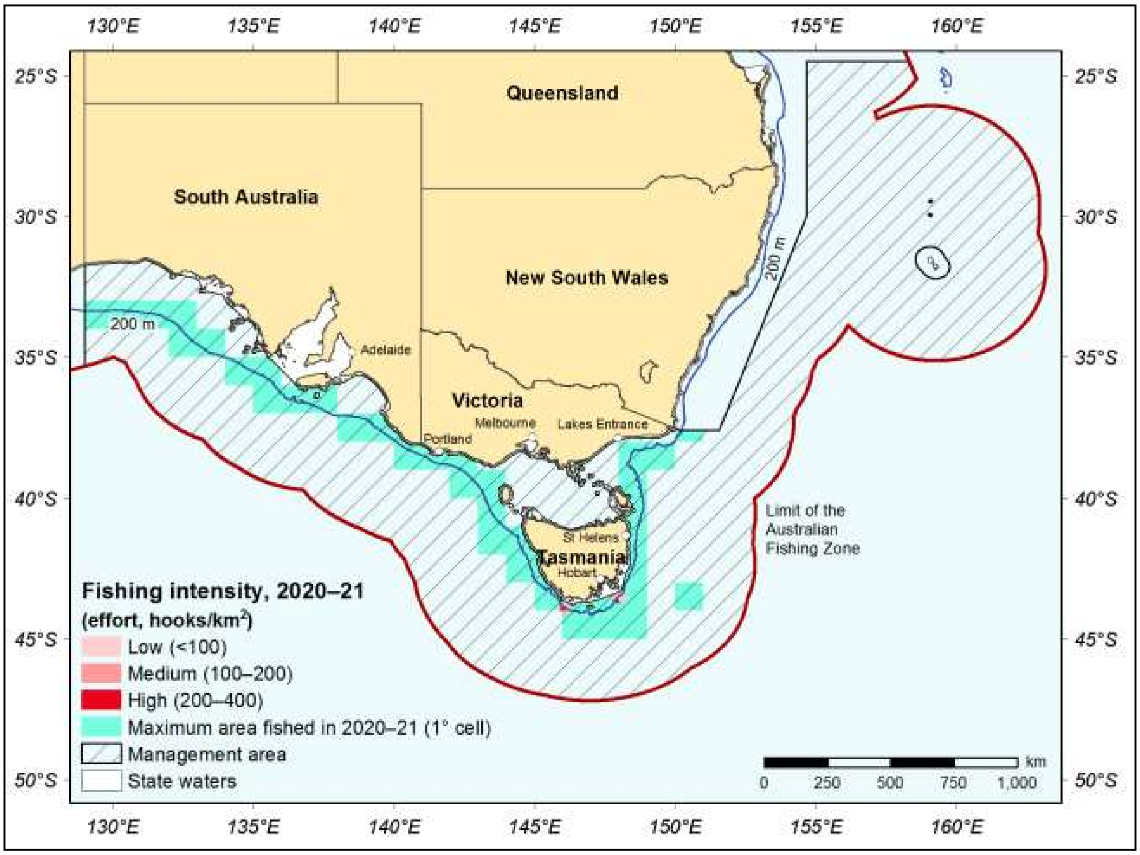
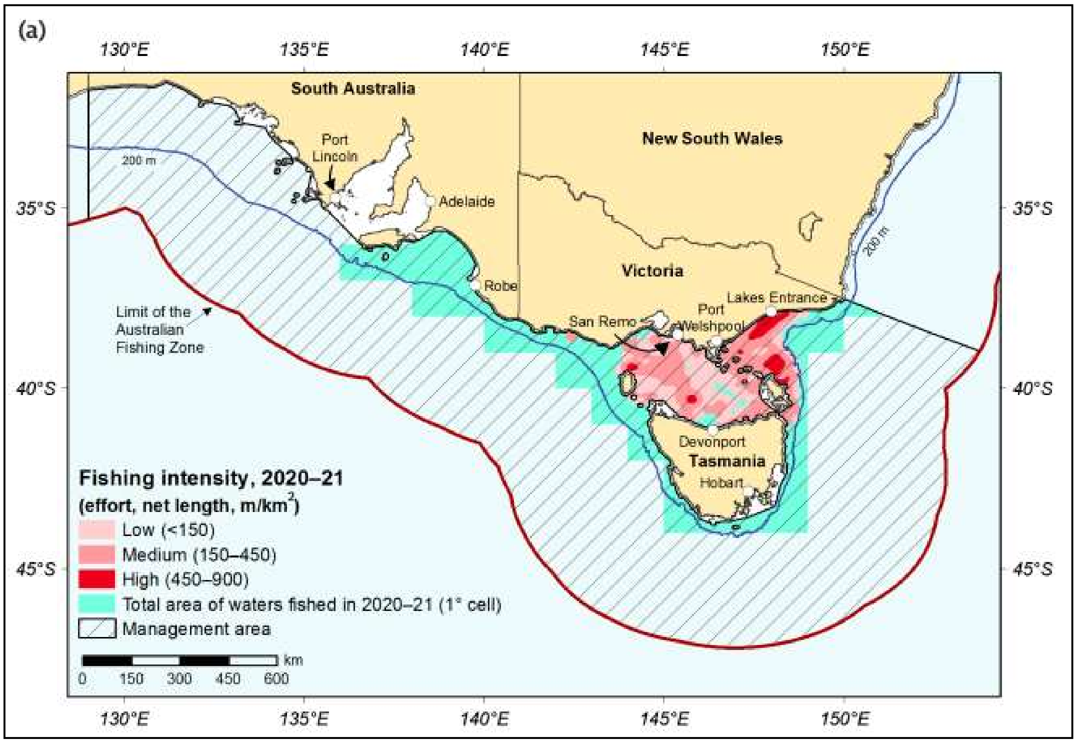


Figure 5-34 Fishing intensity in the Scalefish Hook Sector during the 2020-2021 fishing season

The Victorian Fisheries Authority do not provide catch data comprising less than five vessels to maintain confidentiality, and therefore, as there were less than five vessels reporting fishing effort in the polygon, the catch and value data cannot be provided for the polygon (SETFIA, 2022).

5.6.1.1.4 Shark Gillnet and Shark Hook Sectors

The SGSHS are part of the Gillnet, Hook and Trap Sector of the SESSF. Most fishing in the SGSHS using nets occurs in Bass Strait, while most fishing using hooks occurs off South Australia, shown by the fishing intensity figures of the sector in Figure 5-35 (Patterson, et al., 2021).



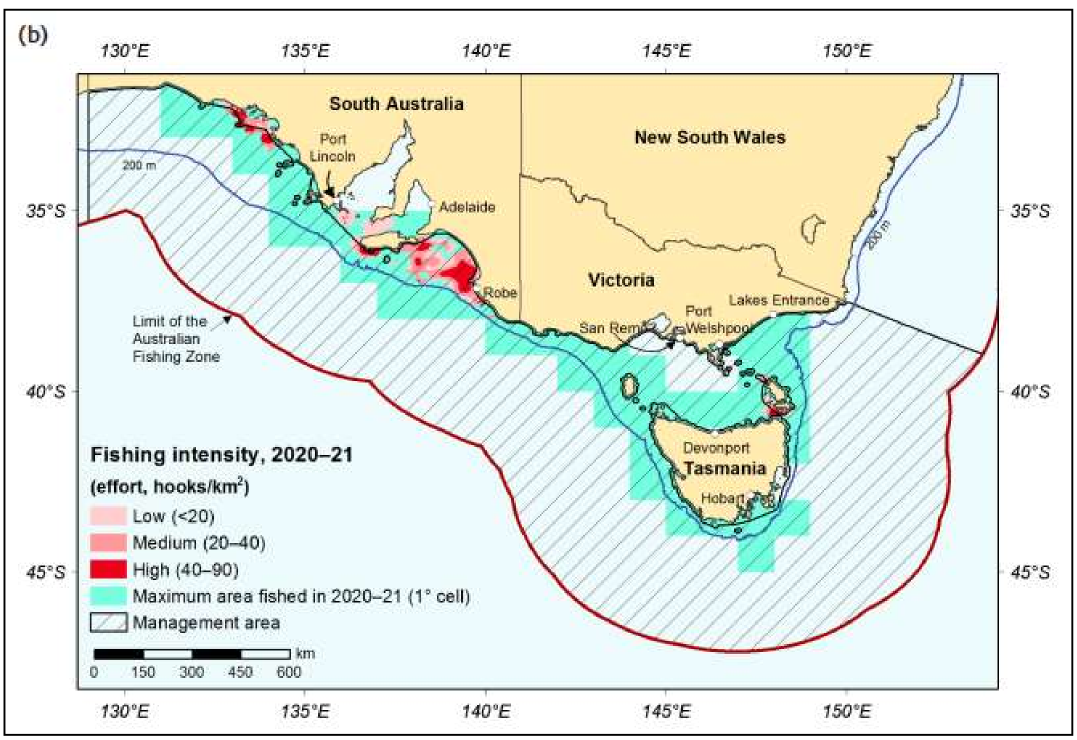


Figure 5-35 Fishing intensity in the Shark Gillnet Sector (a) and the Shark Hook Sector (b) of the Southern and Eastern Scalefish and Shark Fishery during the 2020-2021 fishing season

Catch and effort has decreased by more than 50 percent since peak landings in the 1980's, mainly due to declining stocks of school shark (*Galeorhinus galeus*) (Figure 5-36). The stock was listed as Conservation Dependent under the EPBC Act in 2009 and is now under a rebuilding strategy through conservative management arrangements (including gear restrictions and closures). Other measures to control school shark catch include the implementation of a catch ratio of 20 percent school shark to gummy shark (*Mustelus antarcticus*) – whereby a quota holder must hold five times more gummy shark quota than their school shark catch and the requirement that all live-caught school shark be released. Gear and area closures have also been implemented (primarily off South Australia) to reduce the risk of interactions with Australian sea lions (*Neophoca cinerea*) and dolphins which are also protected species. These have changed the fishing areas and targeting behaviour of fishers, and influenced the catch of target species. Before spatial closures, which have been progressively implemented since 2003, effort in the SGSHS was spread across the waters off South Australia and eastern Victoria. However, the spatial closures outlined above have resulted in gillnet effort being concentrated off Victoria more recently as is evident in Figure 5-35 (Patterson, et al., 2021).

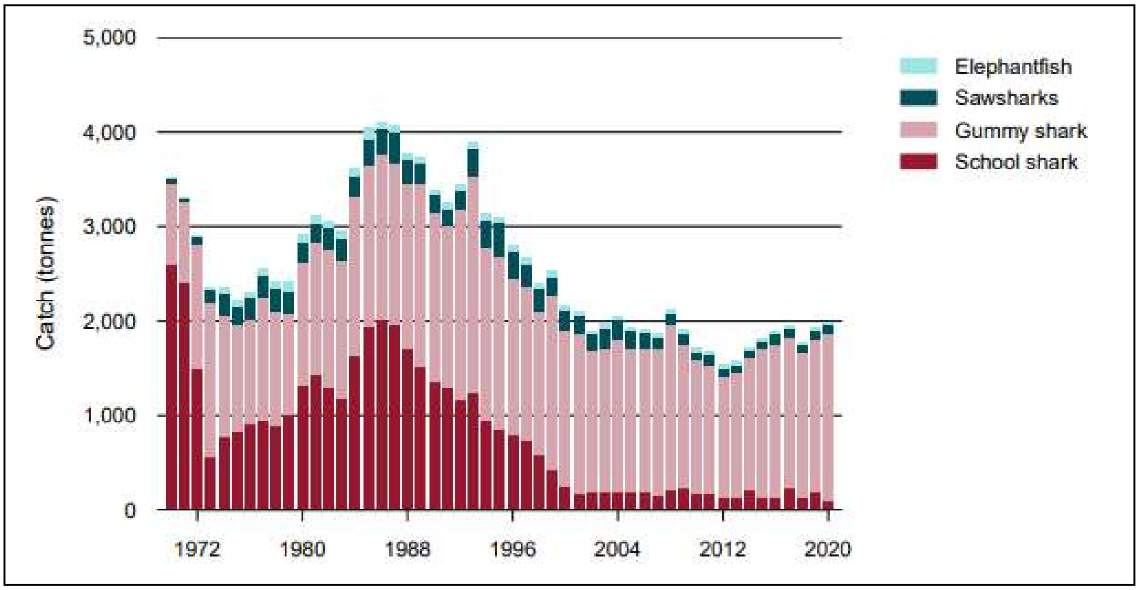


Figure 5-36 Annual landings in the Shark Gillnet and Shark Hook Sectors by species, 1970 to 2020

A summary of the specific catch, effort and value of the SGSHS within the polygon for the period 2011-2012 to 2020-2021 is provided in Table 5-19 (SETFIA, 2022). The polygon is a high effort area for demersal gillnets (Figure 5-37), although some recent (2020-2021) effort in the area recorded shark fishers using demersal longlines and one vessel using auto longline (SETFIA, 2022).

Table 5-19 Shark Gillnet and Shark Hook Sectors fishing effort, catch, value and main target species from polygon from 2011-2012 to 2020-2021

	Demersal gillnet	Longline
Number of different vessels	28	6
Total shots	7305	74

	Demersal gillnet	Longline
Total catch (t)	1413	5.5
Total value	$8,591,164	$36,062
Main species caught	• Gummy shark (76%) • Common sawshark (5%) • Elephantfish (4%)	• Gummy shark (71%)
Fishing methods used	• Gillnet	• Demersal longline • Auto longline

5.6.1.1.5 Southern Squid Jig Fishery

The Southern Squid Jig Fishery (SSJF is located in waters off New South Wales, Victoria, Tasmania and South Australia, and in a small area off southern Queensland. Refer to Figure 5-37 (Patterson, et al., 2021). The SSJF is a single-method (jigging) fishery, primarily targeting the Gould's squid (*Nototodarus gould*). Vessels typically operate at night in continental shelf waters between 60-120 metre water depths. Squid are also caught in as incidental catch in the CTS of the SESSF. In 2020, there were five active vessels and a total of 1711 jig-hours in the SSJF. From 1996 to 2005, annual average jig fishing effort was high at 8878 jig-hours before declining to just 50 jig-hours by 2014. Since 2015, annual jig fishing effort has fluctuated between 1304 and 2281 jig-hours. This is attributed to high costs relative to revenue, combined with the variable biomass and/or availability of the stock (Patterson, et al., 2021). Nine SSJF vessels fished within the polygon in Bass Strait over just 91 days between 2011-2021, with a total catch of 116 tonnes valued at $255,000 (SETFIA, 2022).

5.6.1.1.6 Bass Strait Central Zone Scallop Fishery

The Bass Strait Central Zone Scallop Fishery operates in Commonwealth waters between Victoria and Tasmania, as shown in Figure 5-38 (Patterson, et al., 2021). Scallop populations throughout the world fluctuate quite dramatically in response to variable environmental conditions. Relatively high populations occur in some years. These can be followed by relative scarcity. As a result, the fishery has a history of boom and bust, with peaks in catch (1982-1983, 1994-1996, 2003 and 2018) interspersed with fishery-wide closures, the most recent being from 2006-2008. The number of active vessels has declined over the past three decades, from 103 during the period 1994-1996 to 11 or 12 vessels in recent years (Patterson, et al., 2021).

The fishery is a single-species fishery targeting dense aggregations (beds) of commercial scallop (*Pecten fumatus*) using scallop dredges.

Although there was fishing effort reported in the polygon in Bass Strait, it was for less than five vessels so the catch and values are unable to be reported for commercial reasons (SETFIA, 2022).

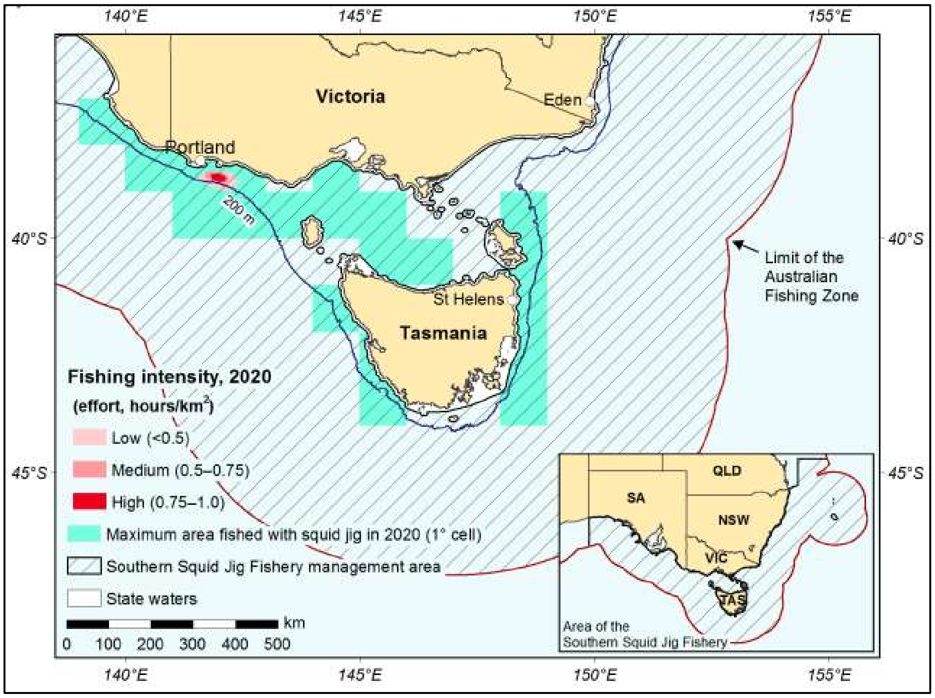


Figure 5-37 Areas and relative fishing intensity in the Southern Squid Jig Fishery

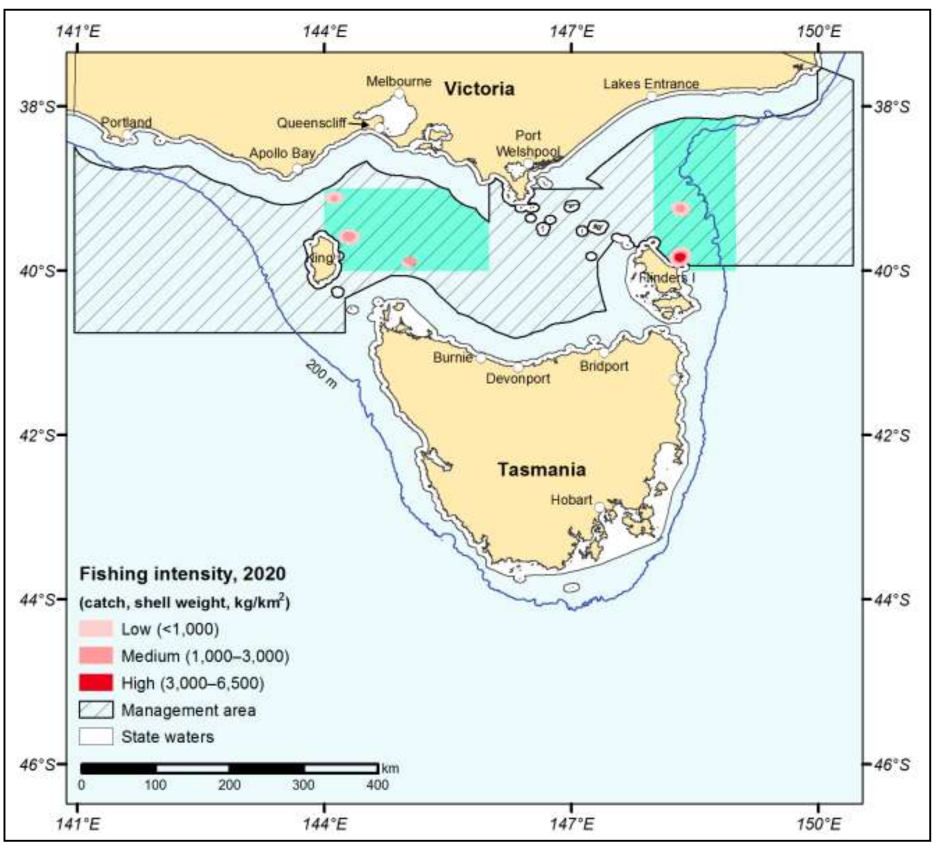


Figure 5-38 Relative fishing intensity and fishing areas for the Bass Strait Central Zone Scallop Fishery in 2020

5.6.1.2 State-managed commercial fisheries

Each state manages their fishing operations under their own constitutional arrangement. The Offshore Constitutional Settlement allows for individual fisheries to be managed under relevant State government, with fishing areas extending into both Commonwealth and State waters.

The Victorian fisheries are managed under the *Fisheries Act 1995*. The Offshore Constitutional Settlement allows for individual fisheries to be managed under relevant State government, with fishing areas extending into both Commonwealth and State waters. Table 5-20 (VFA, 2022) describes the Victorian State-managed fisheries.

For the financial years 2011-2012 to 2020-2021, a total of 51 different fishers undertook 7687 days of fishing, catching a total of 15,418.6 tonnes (SETFIA, 2022). Victorian managed fisheries that reported effort in this time were the ocean general, purse seine (ocean), inshore trawl, rock lobster, scallop, and octopus (eastern zone). Most of the catch came from grids closest to Lakes Entrance, with 3909 tonnes taken from C42 and 3012 tonnes from C43, as shown in Figure 5-39 (SETFIA, 2022). Some fishing effort was reported from most grid cells in the polygon, but mostly by less than five fishers and therefore the catch data is not available, as shown in Figure 5-40 (SETFIA, 2022). Total catch has decreased in the polygon despite an increase in effort and number of fishers.

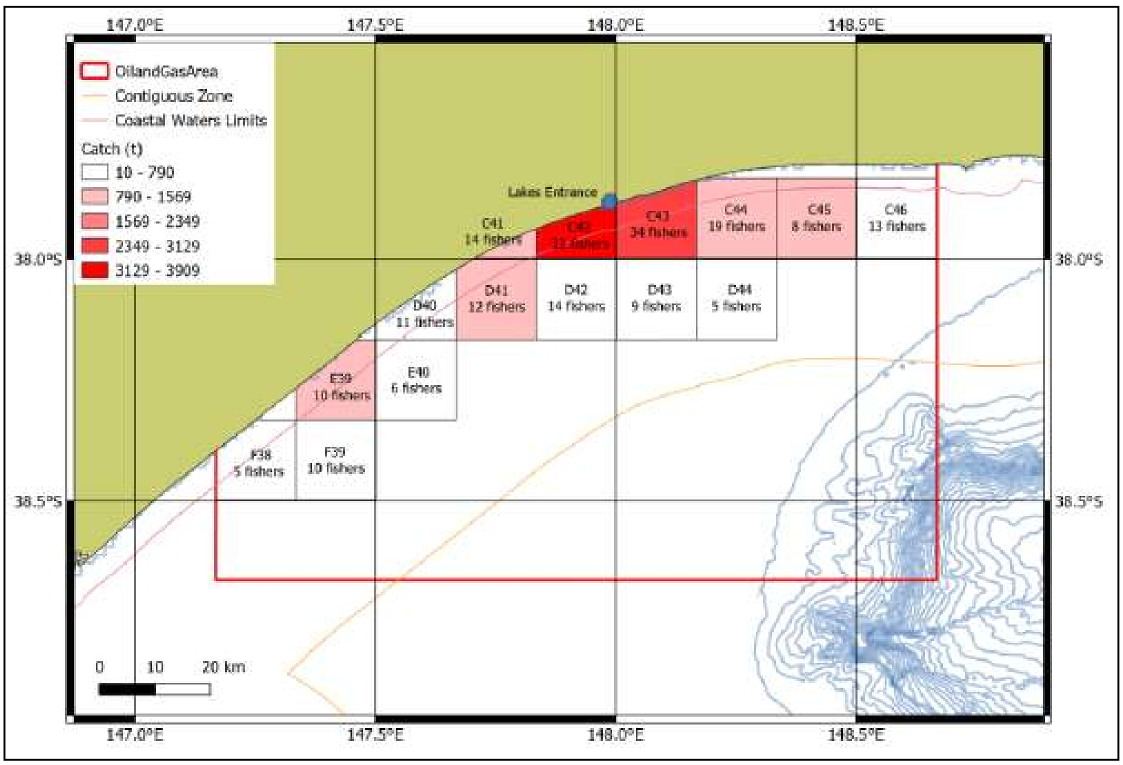


Figure 5-39 Catch (days) by Victorian fisheries by reporting grid from 2011-2012 to 2020-2021

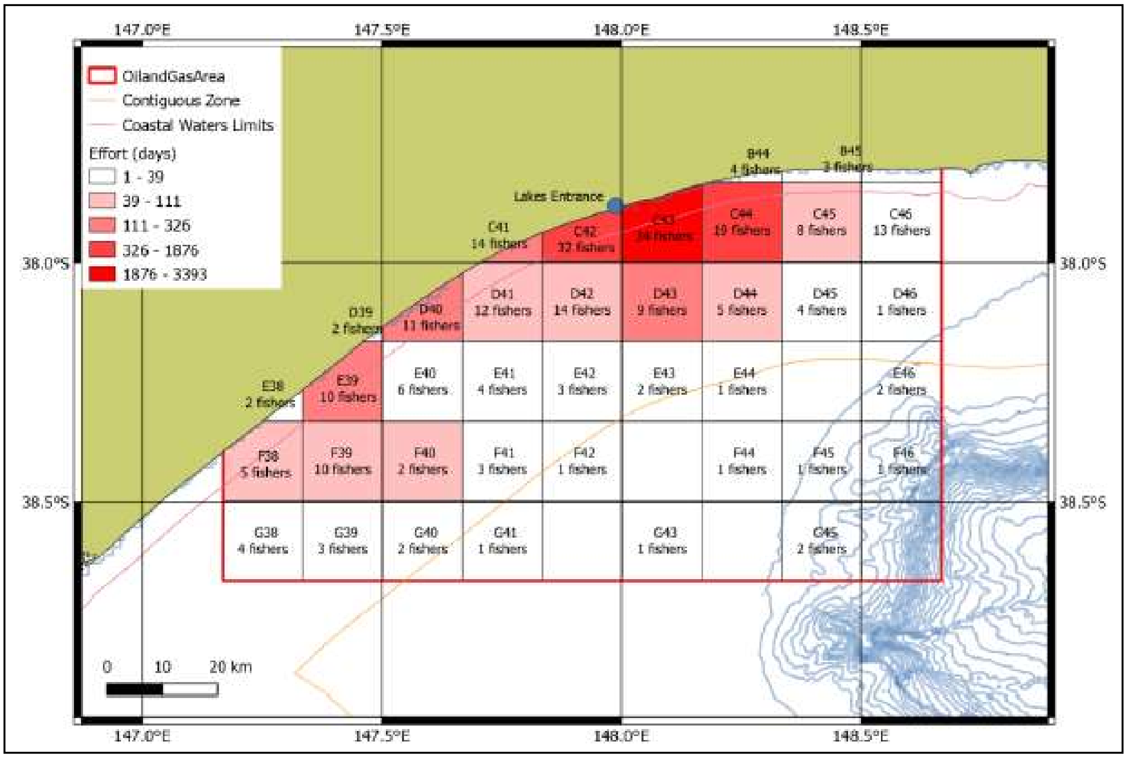


Figure 5-40 **Effort (tonnes) by Victorian fisheries by reporting grid from 2011-2012 to 2020-2021**

Table 5-20 Victorian State-managed commercial fisheries

Grey cells indicate fisheries operate in shallow coastal waters or within bays, inlets or estuaries, all away from the OAs (SETFIA, 2022).

Fishery	Description	Extends into Cth waters	Target species
Abalone Fishery Restricted to <30m depth	Abalone are caught along the majority of the Victorian coastline. Abalone diving activity typically occurs close to the shoreline (generally up to water depths of 30m). The Abalone Fishery is quota managed, with a total allowable commercial catch set annually based on the outcomes of a stock assessment process. There are three (western, central and eastern) management zones. The blacklip abalone (*Haliotis rubra*) forms the basis of the abalone fisheries in New South Wales, Victoria and Tasmania, however greenlip abalone (*Haliotis laevegata*) are also targeted. Blacklip abalone are commonly found, mainly on rocky substrates, and are widely distributed along the southern half of Australia as far as Rottnest Island in the west to Coffs Harbour in the east. Abalone are sourced from the wild and from coastal farms. Victoria's abalone farms are situated primarily in Port Phillip Bay and southwest Victoria, however farms are also located off Tullaberga Island and Gabo Island (Department of Primary Industries and The Ecology Lab Pty Ltd, 2007).	Yes	Greenlip abalone Blacklip abalone
Bait Fishery No active fishing+	The Victorian commercial Bait Fishery encompasses the harvest of fish and invertebrates including crustaceans and molluscs from coastal areas, bays, inlets, estuaries and inland streams and waterbodies for commercial purposes (Ingram, Conron, Hall, & Hamar, 2016).	No	Sandworm Clood cockle Pipi Eastern king prawn Ghost shrimp Australian anchovy

Fishery	Description	Extends into Cth waters	Target species
Eel Fishery Restricted to coastal river basins	Eel are harvested in Victorian coastal river basins south of the Great Dividing Range. Short-finned eels (*Anguilla australis*) are found across the State, while long-finned eels (*Anguilla reinhardtii*) are only found in eastern Victoria.	No	Short-finned eel Long-finned eel
Giant Crab Fishery No active fishing+	The Giant Crab Fishery has two management zones, the Western Zone and Eastern Zone, a division which reflects the zonal boundaries of the Rock Lobster Fishery. The Fishery is based in the Western Zone; at the time of writing there was no giant crab (*Pseudocarcinus gigas*) fishing in the Eastern Zone where the OAs are located. Giant crabs inhabit the continental slope at approximately 200m depth and are most abundant along the narrow band of the shelf edge.	Yes	Giant crab
Inshore Trawl Fishery	The Inshore Trawl Fishery is comprised of 54 licence holders who exclusively trawl various net types (stern, otter, bottom or demersal trawling) to target both demersal and non-pelagic finfish (Seafood Industry Victoria, 2022).	Yes	Southern sand flathead King George whiting Tiger flathead Eastern school whiting Gummy shark Eastern school prawn pale octopus
Multi-species ocean fisheries	This category includes ocean general fishing licences, allowing for multi-species of fish to be caught and includes the purse seine. The ocean access fishery is the largest in terms of licence holders (162 in 2018 (Abernethy, Barckay, McIlgorm, & Gilmour, 2020)) and the most varied in terms of permitted gear. The fishery occurs throughout Victorian coastal waters and a wide variety of species are caught.	Yes	Multi-species
Octopus (Eastern Zone) Fishery	Victoria's Octopus (Eastern Zone) Fishery commenced on 1 August 2020 and builds on the success of the emerging boutique octopus fishery, which was established within another licence class over the prior five years. It harvests mainly pale octopus (*Octopus pallidus*) in East Gippsland using purpose-built	Yes	Octopus Maori Octopus

Fishery	Description	Extends into Cth waters	Target species
	unbaited traps which minimise bycatch. The Eastern Zone extends from approximately Seaspray to the Victorian/New Southj Wales border and out to 20 nautical miles offshore, except for marine reserves. At the time of writing there were 11 licences issued for the Eastern Zone with harvests managed using quotas, the allowable catch for 2021 season was 68.7 tonnes.		Gloomy Octopus
Pipi Fishery Occurs on beaches and intertidal zones	Pipi is the common name given to the small bivalve which is found on high-energy sandy beaches in the intertidal zone. The Pipi Fishery covers the entire Victorian coastline, with the exception of Port Phillip Bay and Marine National Parks where shellfish cannot be harvested in the intertidal region. However, the Fishery is only currently open at Discovery Bay (targeted primarily by commercial fishers) and Venus Bay (primarily a recreational fishery).	No	Pipi
Rock Lobster Fishery	The Rock Lobster Fishery is divided into two separately managed zones: Eastern and Western. The Eastern Zone extends west from the New South Wales border to Apollo Bay; the Western Zone extends from Apollo Bay west to the border with South Australia. The main ports in the Eastern Zone are Queenscliff, San Remo and Lakes Entrance. Rock lobster is Victoria's second most profitable fishery after abalone. Southern rock lobsters (*Jasus edwardsii*) are found to depths of 150m, with most of the catch coming from inshore waters less than 100m deep. Eastern rock lobster (Jasus verreauxi) is the main species harvested, but occasionally southern rock lobster, and tropical rock lobster are also caught. Rock lobster fishing grounds exist around the southern tip of Wilsons Promontory and around Bass Strait islands, such as the Hogan Group, Curtis Group, Kent Group islands and Flinders Island. Most fishing occurs between mid-November and March, outside the June to mid-November spawning season.	Yes	Southern rock lobster Eastern rock lobster
Scallop Fishery	The Victorian Scallop Fishery is one of three scallop zones in the Bass Strait, and extends out from the coastline to 20nm excluding the bays and inlets along the coast where commercial fishing for scallops is prohibited. Historically, the majority of the fishing activity in the Victorian zone has occurred in the eastern waters of the State, with most vessels launching from the ports of Lakes	No	Primary: Commercial scallop Other: Doughboy scallop

Fishery	Description	Extends into Cth waters	Target species
	Entrance and Welshpool. The Victorian Scallop Fishery is based on the species, *Pecten Fumatus*. Occasionally, incidental catches of doughboy scallops (*Chlamys asperrimus*) are taken as by-product, but are generally not in commercial quantities. Scallop abundance is naturally highly variable causing catches to fluctuate widely from season to season. When open, the Fishery is managed using a quota management system of individual transferable quota. Annual consultation is undertaken to determine the TAC and is based on a combination of stock survey analysis and scientific and industry expertise. Fisheries Victoria, on behalf of the Minister for Agriculture and Food Security, sets the TAC via a Quota Notice which is distributed equally amongst the 91 maximum allowable licences. The 2022 pre-season survey conducted in December 2021 identified viable fishing abundance in the Tarwhine beds near the Tarwhine oil and gas fields of Bass Strait.		
Wrasse Fishery No active fishing+	The commercial Wrasse Fishery extends along the entire length of the Victorian coastline and out to 20nm offshore, except for marine reserves. The Fishery is divided into three commercial management zones; licence holders can fish in any of these zones; West, Central and the East (the East encompasses the OAs). Most wrasse is harvested by hook and line although commercial rock lobster fishers who also hold a commercial wrasse licences can keep those fish that they catch in their rock lobster pots.	Yes	Primary: Bluethroat wrasse, purple Wrasse Other: Rosy wrasse, senator wrasse, Southern maori wrasse
Sea Urchin Fishery Generally in waters <30m depth	The Sea Urchin Fishery comprises four individual management zones. The central and eastern zones are inshore of the OAs. The central zone covers Victorian waters from Hopkins River to Lakes Entrance. The eastern zone extends from Lakes Entrance to the New South Wales border. The target species are the white sea urchin (*heliocidaris erythrogramma*) and the black, long-spined sea urchin (*Centrostephanus rodgersii*). The sea urchin is usually collected by hand by divers. Currently, sea urchin will only be harvested in eastern Victoria, primarily out of Mallacoota, and in Port Phillip Bay (VFA, 2017).	No	White sea urchin Black, long spined sea urchin

Fishery	Description	Extends into Cth waters	Target species
Commercial Bay and Inlet Fisheries Within bays and inlets only	The Commercial Bay and Inlet Fisheries of Victoria are a collection of complex multi-species, multi-gear fisheries which operate in environments that are ecologically distinct to those existing in waters of both their catchment tributaries and the nearby ocean. Although between 60-80 fish species have been recorded from commercial bay and inlet catches, only about a dozen or so key species, including King George whiting, black bream, snapper, flathead, mullet, garfish, flounder, anchovies and pilchards, are usually targeted by commercial fishers. Commercial fishing for fin fish occurs in Port Phillip Bay, Corner Inlet/Nooramunga and the Gippsland Lakes. All other Victorian bays, inlets and estuaries are closed to commercial fishing (other than for eels and bait). The main bay and inlet commercial fishing methods are seine nets and gillnets.	No	King George whiting Black bream Snapper Flathead Mullet Garfish Flounder Anchovies Pilchards

+ No active fishing in polygon as reported (SETFIA, 2022).

5.6.1.3 Recreational fishing

Recreational fishing in Australia is a multi-billion-dollar industry. Most recreational fishing typically occurs in nearshore coastal waters (shore or inshore vessels), and within bays and estuaries. Offshore fishing (>5 kilometres from the coast) only accounts for approximately 4 percent of recreational fishing activity in Australia; charter fishing vessels are likely to account for the majority of this offshore fishing activity (Fisheries Research and Development Corporation, 2001).

Recreational fishing occurs mostly amongst the Nooramunga islands (near Corner Inlet), on the Gippsland Lakes, along Ninety Mile Beach, at Cape Conran Coastal Park and Croajingolong National park and off the coast of Mallacoota, comprising both boat-based fishing and beach-based surf fishing. All these are outside the OAs. Boat-based fishing includes charter operations and private craft launched from boat ramps in the region. Boatyards and slipways are located at Bullock Island (Lakes Entrance), Port Welshpool and Mallacoota. Common recreational fish species include tiger flathead (*Neoplatycephalus richardsoni*), bream, snapper, Australian salmon (*Arripis trutta*), and lobster. Offshore catches can include mackerel, tuna, groper and shark.

5.6.2 Oil and gas

Victoria's petroleum (oil and gas) exploration and production is concentrated in the offshore Commonwealth waters of the Otway Basin and Gippsland Basin. Information on the Production Licences, Exploration Permits, Retention Leases and acreage releases (including greenhouse gas) within Gippsland Basin at the time of writing are presented in Figure 5-41 (NOPTA, 2022) and in Table 5-21 (NOPTA, 2022).

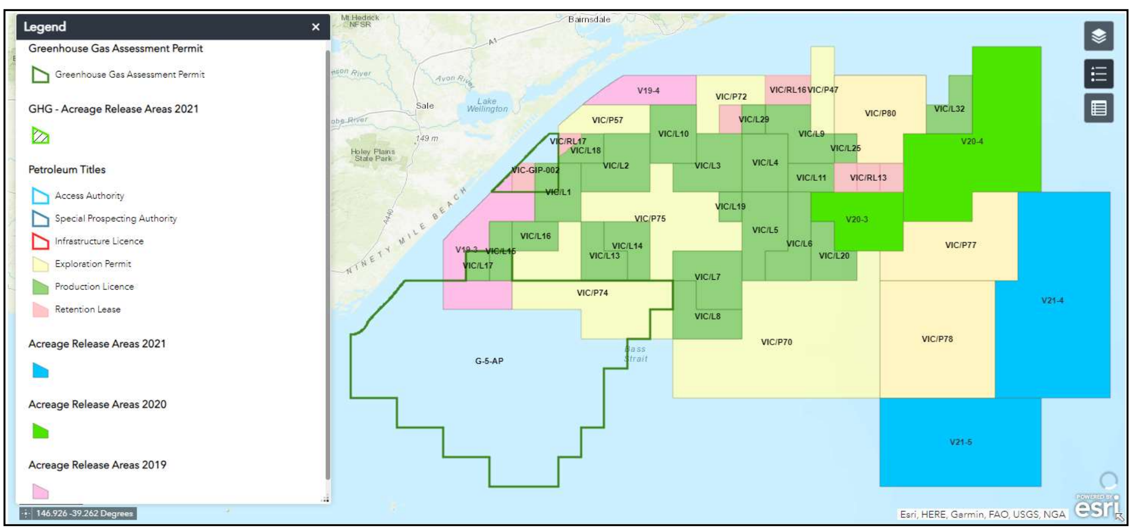


Figure 5-41 Gippsland Basin permit areas

Table 5-21 Production Licences, Exploration Permits and Retention Leases within Gippsland Basin

Title	Title holder(s)	Field
Production Licences, Gippsland Basin		
VIC/L1	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Barracouta/Tarwhine/ Whiptail
VIC/L10	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Snapper
VIC/L11	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Flounder
VIC/L13-14	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Bream
VIC/L15	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Dolphin
VIC/L16	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Torsk
VIC/L17	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Perch
VIC/L18	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Seahorse
VIC/L19	EARPL, Woodside Energy (Bass Strait) Pty Ltd	West Fortescue
VIC/L2	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Barracouta/Whiting/Wirrah
VIC/L20	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Blackback
VIC/L21	Cooper Energy	Patricia Baleen
VIC/L25	EARPL, Woodside Energy (Bass Strait) Pty Ltd, Mitsui E&P Australia Pty Ltd	Kipper
VIC/L29	SGH Energy	Longtom
VIC/L3	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Marlin/Turrum/North Turrum
VIC/L32	Cooper Energy	Sole
VIC/L4	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Marlin/Turrum/Tuna/Baldfish/ Flounder
VIC/L5	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Halibut/Fortescue/Cobia/ Mackerel
VIC/L6	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Mackerel/Flounder
VIC/L7-8	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Kingfish
VIC/L9	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Tuna
VIC/L31	Carnarvon Hibiscus	West Seahorse (see VIC/P57)

Title	Title holder(s)	Field
Exploration Permits, Gippsland Basin		
VIC/P47	Emperor Energy/Shelf Energy	Judith/Moby
VIC/P57	Carnarvon Hibiscus	West Seahorse/Sea Lion (See VIC/L31)
VIC/P68	Bass Oil	Leatherjacket
VIC/P70	Esso Deepwater	Dory/Baldfish
VIC/P72	Cooper Energy	-
Retention Leases, Gippsland Basin		
VIC/RL1	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Golden Beach
VIC/RL4	EARPL, Woodside Energy (Bass Strait) Pty Ltd	Remora
VIC/RL13 VIC/RL14 VIC/RL15	Cooper Energy	Basker, Manta, Gummy Field
VIC/RL16	Cooper Energy	Patricia Baleen
VIC/RL17	Carnarvon Hibiscus	West Seahorse

Petroleum infrastructure in the Gippsland Basin is well developed, with a network of pipelines transporting hydrocarbons produced offshore to onshore petroleum processing facilities at Longford and Orbost. Overall production of crude oil and condensate from the Gippsland Basin has been declining for over three decades, while gas production has remained relatively steady. Total petroleum production from Victoria as compared to total Australian production is shown in Table 5-22 (APPEA, 2021).

Table 5-22 Production of petroleum liquids and natural gas in Victoria compared to Australia total

Product	Crude Oil		Condensate		LPG		Conventional gas	
Units	Millions of barrels						Billion cubic feet	
Year	2019	2020	2019	2020	2019	2020	2019	2020
Victoria	3.3	3.0	7.5	8.0	8.0	6.7	307.4	283.1
Australia total	47.5	48.0	87.5	31.0	32.8	88.0	3597.1	3598.5

5.6.3 Shipping

The southeast coast is one of Australia's busiest in terms of shipping activity and volumes. This traffic includes international and coastal cargo trade, and passenger and ferry services.

Major ports include Melbourne, Geelong and Western Port, with other minor ports important to commercial and recreational fishing, yachts and other pleasure craft.

A shipping exclusion zone, ATBA exists around the operating oil and gas facilities in the Gippsland Basin, where unauthorised vessels larger than 200 gross tonnes are excluded from entry. The ATBA is defined in Schedule 2 of the OPGGS Act and shown in Figure 5-42 (Australian Border Force, 2022). Two TSS have been implemented to enhance safety of navigation around the ATBA by separating shipping into one-direction lanes for vessels heading north eastwards and those heading south-westwards. One separation area is located south of Wilsons Promontory, and the other south of KFB.

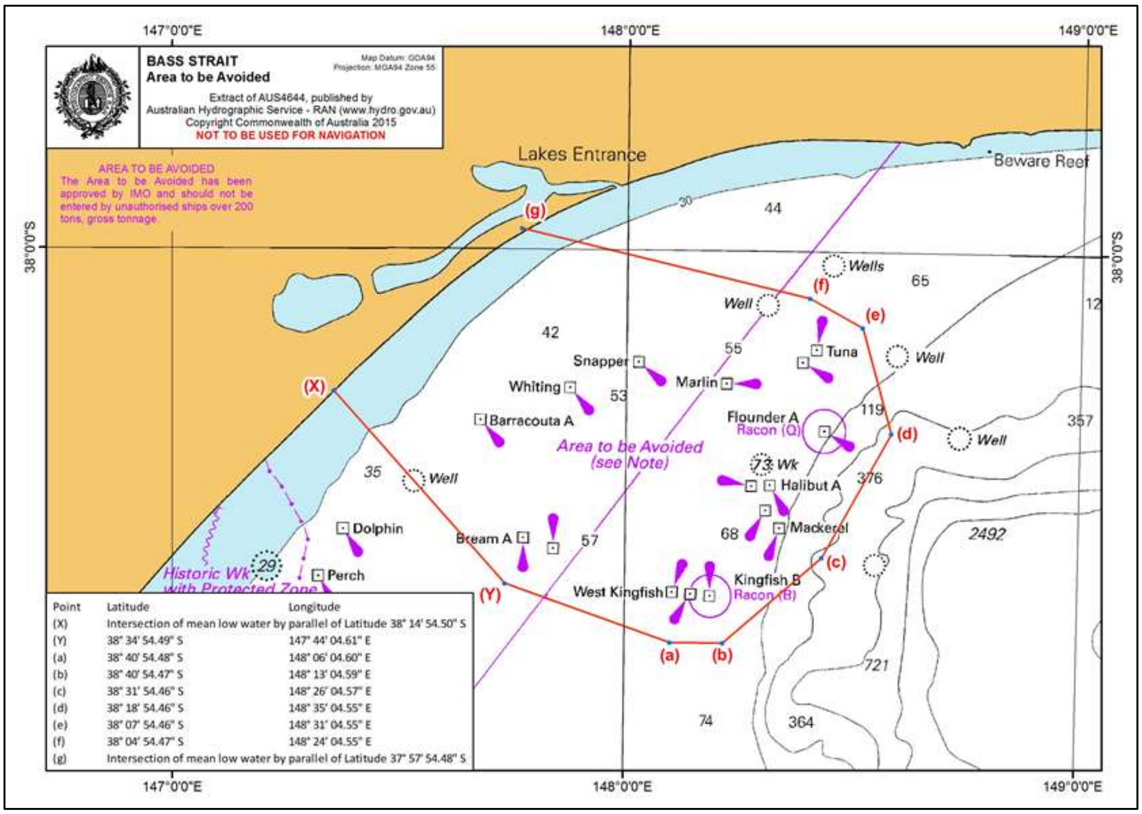


Figure 5-42 Shipping exclusion zones (Area To Be Avoided)

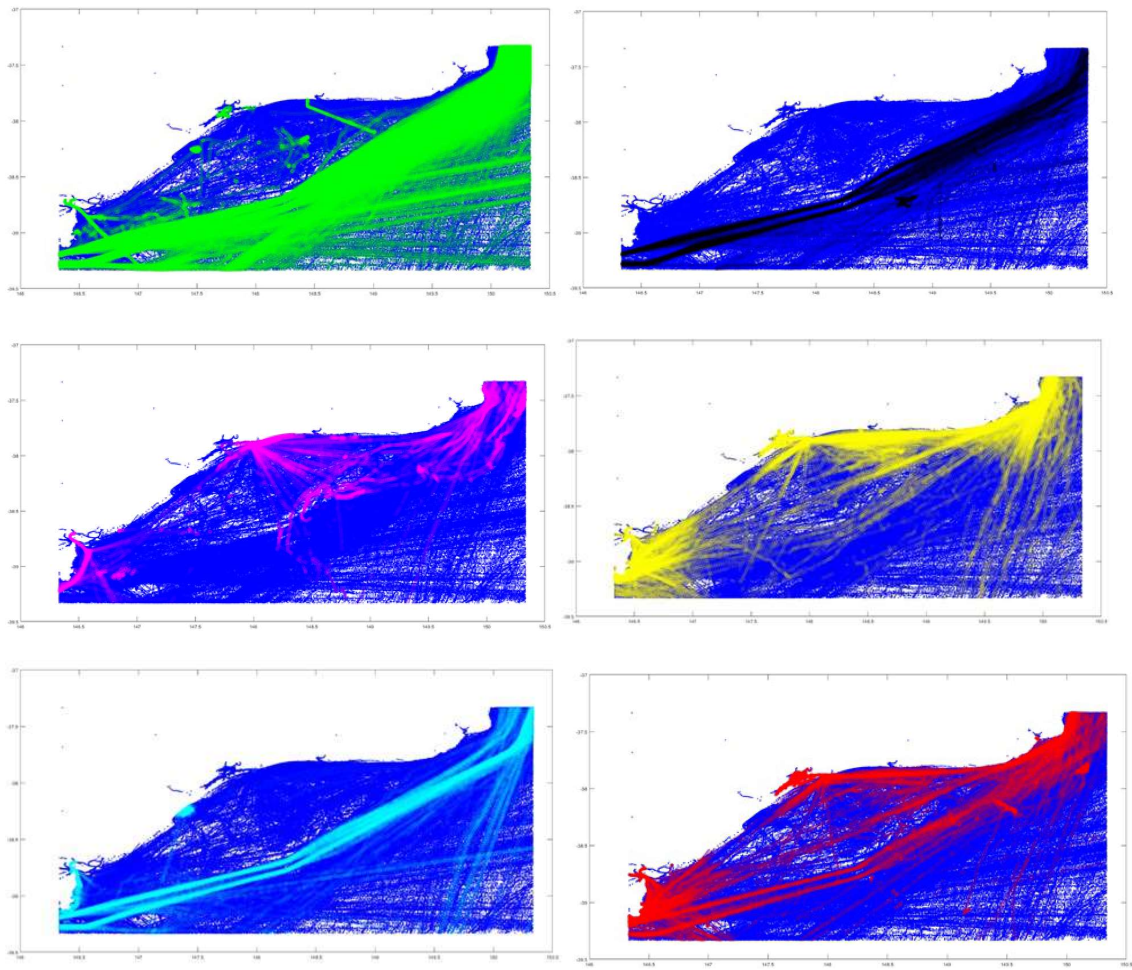
A study to assess the impact to users of the sea as a consequence of decommissioning (AMC Search, 2022a) calculated that for the five-year period between 2015-2019 there were 17,403 transits of Bass Strait. The breakdown of the types of ships making up this number by year is shown in Figure 5-43 (AMC Search, 2022a).

Year	2015	2016	2017	2018	2019
Summary	Transits	Transits	Transits	Transits	Transits
All ships	3604	3521	2025	3111	4199
AIS type 0	384	503	86	160	56
Fishing ships	233	129	135	116	134
Towing ships	8	0	0	2	3
Sailing / Pleasure Craft	353	391	143	321	843
Tugs	30	52	13	11	44
Passenger ships	101	146	46	111	158
Cargo ships	1991	1779	1345	1751	2212
Tankers	350	310	202	286	361
"Other type" ships	103	101	31	297	271
Others	51	110	24	56	117

AIS type 0 – type not available (default unknown), Other type – Hazardous Category A-D, Others – in various other AIS categories not individually listed in this figure.

Figure 5-43 Total ship transits of Bass Strait by year and by ship type

Figure 5-44 (AMC Search, 2022a) shows the vessel tracks by the type or category of vessel. From the diagrams it can be seen that tankers, passenger ships and cargo vessels all keep clear of the ATBA and use the TSS. All other categories use routes through the area where the OAs are located.



First row left – Cargo ships
Second row left – Fishing
Third row left – Passenger

First row right – Tankers
Second row right – Sail/Pleasure craft
Third row right – Type 0 (default /unknown)

Figure 5-44 Ship tracks in Bass Strait by type for period 2015- 2019

5.6.4 Defence

The Australian Defence Force conducts a range of training, research activities, and preparatory operations in Australian waters. These activities may include transit of naval vessels, training exercises, shipbuilding and repairs, hydrographic survey, surveillance and enforcement, demolition, use of explosives, use of radar, sonar, sonobuoys, flares, sensors and other equipment, and search and rescue. There are no offshore primary training locations in Gippsland. The Royal Australian Air Force Base in east Sale is located in Victoria's Gippsland region. The airspace around the base has been sectioned into training areas to support the RAAF's training role.

Mine fields were laid in Australian waters during World War II. Post-war minefields were swept to remove mines and to make marine waters safe for maritime activities. There are three areas identified as dangerous due to unexploded ordnances near the OAs, located south and east of Wilsons Promontory. The coordinates of these per the historical database of ammunition dumping episodes (Department of Defence Australia, 2003) are shown in Table 5-23.

Table 5-23 Depth charges (unexploded) ammunition in Victoria to the north and west of the Operational Areas

Latitude (degrees, minutes, seconds)	Longitude (degrees, minutes, seconds)
- 39,05,44	146,45,05
- 39,38,06	146,46,30
- 38,07,24	148,00,52

5.6.5 Tourism

The Australian coast and marine waters provide a diverse range of recreation and tourism opportunities, including scuba diving, charter boat cruises, cruise shipping, whale and wildlife watching, sailing, snorkelling, surfing, and kayaking.

Tourism is an important industry for Gippsland. The region received approximately 4.7 million domestic (overnight and daytrip) visitors, who spent an estimated $1.1 billion in the year ending September 2021. Tourism generated employment of approximately 11,200 people or 9.8 percent of the region's employment (direct and indirect jobs) (Business Victoria, 2021). In east Gippsland, primary tourist locations are the Gippsland Lakes (the largest inland waterway in Australia), Lakes Entrance, Marlo, Cape Conran and Mallacoota. The area is renowned for its nature-based tourism (e.g. Croajingolong National Park), recreational fishing and water sports (lake and beaches) (Travel Victoria, 2017).

5.6.6 Australian industries

Since the commencement of production in 1969, Esso's Bass Strait operations have provided employment opportunities for local and national Australian industries, skills training and the establishment of local supply chains. This has, and continues to deliver value to Australian, Victorian and local Gippsland communities and economies, both directly and indirectly.

As with the existing Esso operations and approved projects, decommissioning work, including the ongoing preparatory phase which commenced in 2020, requires a broad range of services. All work will continue to be conducted in accordance with state and national laws and policies, and under relevant award and enterprise agreements.

This EP outlines the first of many scopes that are required to decommission the Bass Strait facilities. While these scopes will progressively be submitted for acceptance under subsequent EPs, we forecast the need for supplies and resources for at least the next 20 years and will employ policies, procedures and initiatives to promote the development of Victorian and Australian suppliers. Esso's decommissioning activities will therefore continue to deliver value to Australian economies for many years to come[5].

[5] The criteria for determination of decommissioning end states are driven by the OPGGS (Environment) Regulations which require a demonstration of an equal or better environment outcome to full removal of facilities (refer Section 3).

5.6.7 Future industries

The future of Bass Strait is likely to include other industries, including offshore windfarms for power generation and carbon capture and storage in support of emissions reduction. Several projects are in the development stage and must proceed through the project feasibility and regulatory processes. These projects will likely make a significant contribution to the Victorian socioeconomic environment in the future.

In December 2022, an area covering approximately 15,000 square kilometres in Bass Strait off the coast of Gippsland was formally declared as Australias first offshore wind zone (DCCEEW, Unlocking the Power of offshore wind in Gippsland , 2022). The location of the declared area in relation to the OAs' is shown in Figure 5-45 below. It can be seen that the declared area encompasses all of the SPJ OAs. Feasibility licences can now been applied for proposed projects within the declared area.

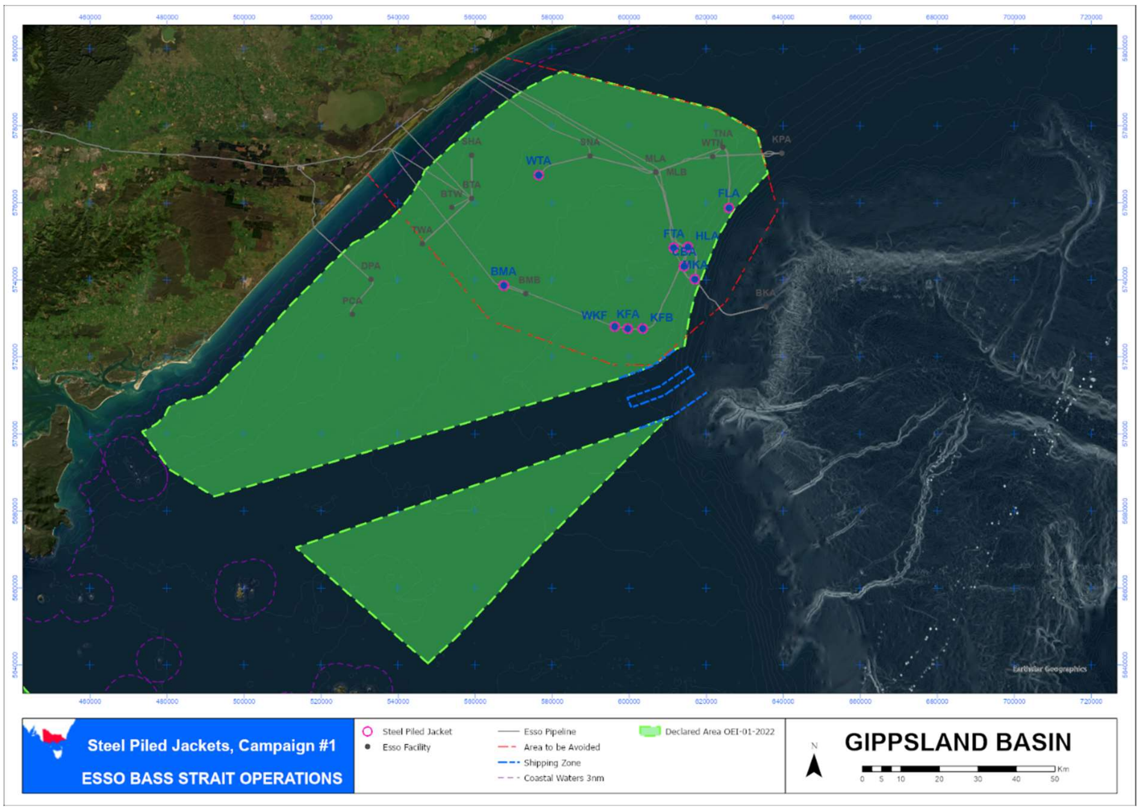


Figure 5-45 Gippsland Offshore Electricity Infrastructure (Declared Area)

5.7 Heritage

5.7.1 Cultural

Australia's Commonwealth Heritage List (DCCEEW, 2021) is a list of Indigenous, historic and natural heritage places owned or controlled by the Australian Government which have significant heritage value to the nation. These and other places within or near the OAs with cultural values are described in this Section.

5.7.1.1 Indigenous Protected Areas

Indigenous Protected Areas (IPAs) are an essential component of Australia's National Reserve System, which is the network of formally recognised parks, reserves and protected areas across Australia, designed to protect the nation's biodiversity. Indigenous Protected Areas protect cultural heritage into the future, and provide employment, education and training opportunities for Indigenous people in remote areas. There are five Indigenous Protected Areas which occur over 100 kilometres from the nearest OA, on and around Flinders Island to the southwest. They are all important rookeries for mutton birds and important cultural resources for Tasmanian Aboriginal people.

In April 2021, the Australian Government committed funding to the Sea Country Indigenous Protected Areas (IPA) Program, under which grants will be provided to Indigenous organisations to expand existing IPAs and create new IPAs ((DCCEEW, Sea Country Indigenous Protected Areas Program - Grant Opportunity , 2023). The program seeks to increase the area of sea within IPAs in Australia. Ten Sea Country IPA consultation projects were announced in May 2022, including the Nanjit to Mallacoota Sea Country IPA consultation project, which extends from Corner Inlet to the Victorian/NSW border (Figure 5-46). The Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC) has signed an agreement with the Australian Government to start the process of establishing the Sea Country IPA and is currently undertaking engagement with families and clans who may have an interest in participating in the development of the IPA (GLAWaC, 2023). The proposed Sea Country IPA area is illustrated in Figure 5-46 and is located in coastal waters, including the Gippsland Lakes and estuaries around Mallacoota, over 35 kilometres from the nearest OA. Sea Country is further discussed in Section 6.7.2.4.2.

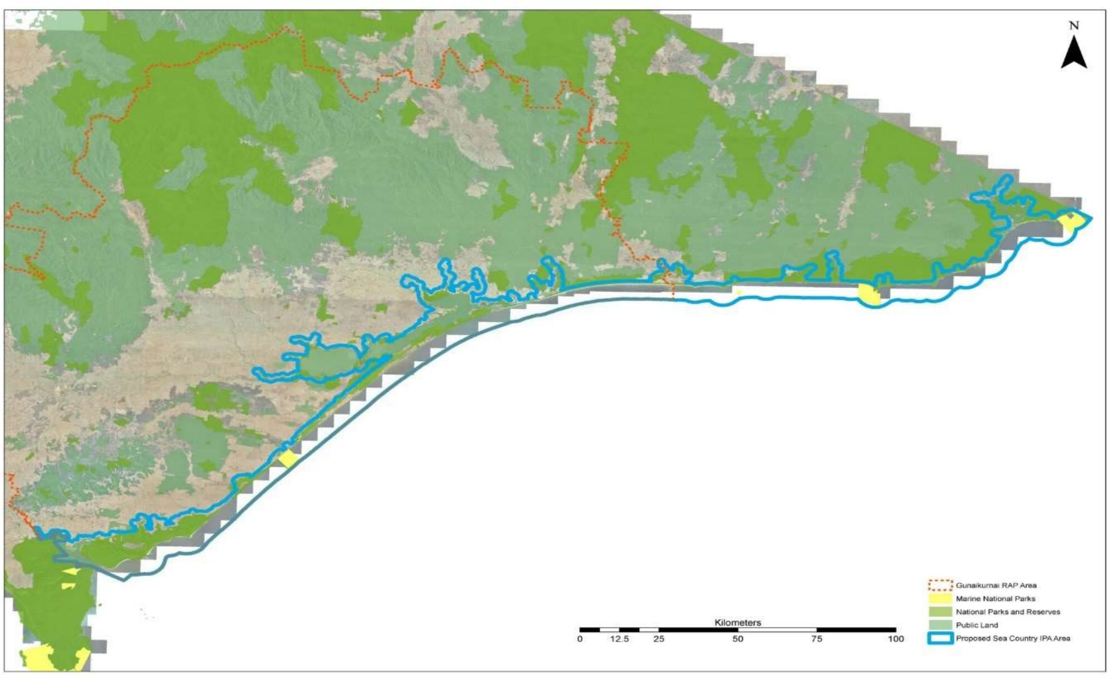


Figure 5-46 Proposed Nanjit to Mallacoota Sea Country Indigenous Protection Area (DCCEEW, Sea Country Indigenous Protected Areas Program - Grant Opportunity , 2023)

5.7.1.2 Native Title

The Gunaikurnai people hold native title over much of Gippsland, including the majority of the coastline adjacent to the OAs. The Native Title Determination Area (Tribunal file no. VCD2010/001) covers approximately 45,000 hectares and extends from west Gippsland near Warragul, east to the Snowy River, and north to the Great Dividing Range, (Figure 5-47). It also includes 200 metres of offshore sea territory between Lakes Entrance and Marlo. The area includes 10 parks and reserves that are jointly managed by the Victorian Government and the Gunaikurnai people. The closest of these parks and reserves to the OAs are the Gippsland Lakes Coastal Park and the Lakes National Park, located approximately 25km from the closest OA.

In general, where non-exclusive native title rights and interests exist over land and water they include:

- rights of access
- rights to use and enjoy the land
- rights to take resources from the land for non-commercial purposes
- rights to protect and maintain sites of importance within the determination area
- rights to engage in certain activities on the land (including camping, cultural activities, rituals, ceremonies, meetings, gatherings, and teaching about the sites of significance within the determination area).

These rights do not confer exclusive rights of possession, use and enjoyment of the land or waters. Native title does not exist in minerals, petroleum or groundwater.

The Gunaikurnai people’s native title determination does not extend to offshore (Commonwealth) waters. However, native title rights and interests can be recognised in offshore waters. Further detail on Native Title is provided in Section 6.7.2.4.1.

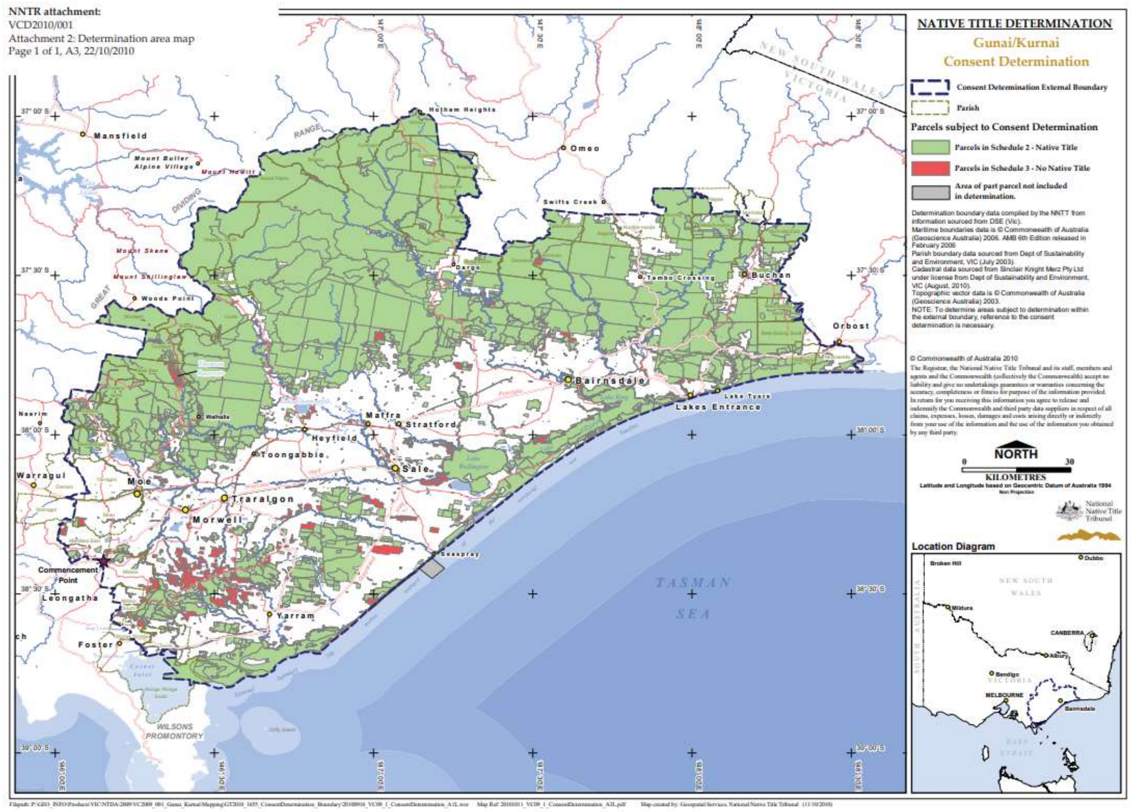


Figure 5-47 Gunaikurnai Native Title Determination Area (VCD2010/01)Indigenous connection to land and sea

The Gunaikurnai people have occupied, used and managed the coastal land and sea environment along the coastline adjacent to the OAs for many thousands of years. These include areas that were dry land before the current sea level stabilised about 5,000 years ago. During the last Ice Age approximately 25,000 years ago, coastlines were on average 125m lower than the present day (Unwelt, November 2022). The Gunaikurnai peoples cultural and spiritual connection with these landscapes continues, even where evidence of previous occupation now lies beneath the ocean (Gunaikurnai Land and Waters Aboriginal Corporation, 2015).

In the past, coastal wetlands were highly productive areas for hunter-gatherer people, having a variety of habitats and species, so the majority of archaeological sites in Victoria are found within 1 kilometre of the coast (Land Conservation Council, 1993). Along the Gippsland coast, stone artefacts that have been found were mostly made from silcrete and quartz from the hinterland. Middens on offshore islands indicate that in the past, Aboriginal people from the area now known as Wilsons Promontory were likely to have visited (Jones & Allen, 1979).

The Gunaikurnai people see no distinction between the land and the sea – it is all part of Country ((GLAWaC, 2023). 'Sea Country' can include parts of open ocean, beaches, land and freshwater on the coast. It encompasses all living things, beliefs, values, creation spirits and cultural obligations connected to an area ((The University of Adelaide, 2023). Water is of particular cultural significance to First Nations people as an integral part of songs, ceremonies, hunting and collecting, and other activities that bind people to their country and each other, including fishing (Smyth, Egan, & Kennett, 2018).

Coastal environments are an integrated cultural landscape/seascape that is conceptually very different from the broader Australian view of land and sea. Protecting this cultural heritage is a major concern for First Nation people (National Oceans Office, 2002). GLaWAC have been consulted during the preparation of this EP. No objections, claims or issues have been raised in relation to activities covered by this EP (refer Section 6).

5.7.2 Historic and natural

5.7.2.1 Historic – maritime

A search of the National Shipwrecks database which includes all known shipwrecks in Australian waters, identified shipwrecks in the vicinity of the OAs as shown in Figure 5-48. Those that are within 10 kilometres of the Esso Bass Strait facilities are listed in Table 5-24. The closest historic shipwreck to any of the OAs covered by this EP is the Struan, 1.95 kilometres from the BMA platform.

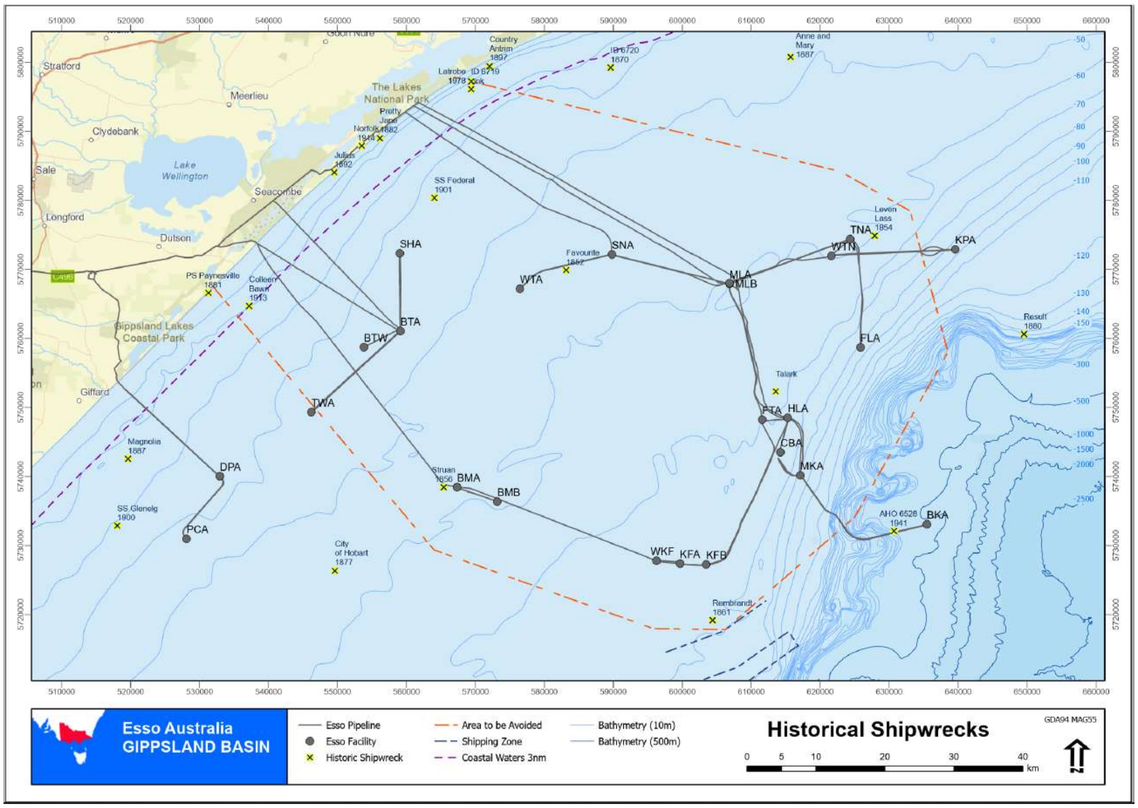


Figure 5-48 Historic shipwrecks around the Esso Bass Strait facilities

Table 5-24 Historic shipwrecks within 10 kilometres of Esso Bass Strait facilities

Vessel name	Year wrecked	Location latitude	Location longitude	Distance to nearest Esso facility (km)+
AHO 6528	1941	-38.55	148.5	0.18 (BKA200 pipeline) (15.8km to MKA platform)
Struan	1856	-38.5	147.75	0.46 (BMA350 pipeline)

Vessel name	Year wrecked	Location latitude	Location longitude	Distance to nearest Esso facility (km)+
				(1.95km to BMA platform)
Favourite	1852	-38.215	147.95	0.66 (WTA200 pipeline)
Talark	unknown	-38.37	148.3	1.94 (HLA600 pipeline) (4.19km to HLA platform)
Leven Lass	1854	-38.165	148.46	2.89
ID 6719*	unknown	-37.98	147.79	5.27
Colleen Bawn*	1913	-38.265	147.425	5.88
Latrobe	1978	-37.97	147.79	6.25
Magnolia	1887	-38.465	147.225	7.09
Pretty Jane	1882	-38.045	147.64	7.68
Rembrandt	1861	-38.67	148.2	8.06
Country Antrim	1897	-37.95	147.82	9.39
SS Federal#	1901	-37.86	149.225	9.49
SS Glenelg#	1900	-38.55	147.21	9.55
PS Paynesville*	1881	-38.25	147.35	9.59
Norfolk*	1914	-38.055	147.61	10.42

Any Esso facility within two kilometres of an historic shipwreck is identified.
* Coastal shipwrecks.
+Distance to closest platform or pipeline.
#Shipwrecks with protected zones.

Some historic shipwrecks lie within a protected or no-entry zone. These zones cover an area around a wreck site and ensure that a fragile or sensitive historic shipwreck is actively managed. Shipwrecks that have protected zones in Victoria around the OAs are the SS Federal and the SS Glenelg and these are identified in Table 5-24 and are also shown in Figure 5-48.

5.7.2.2 Historic - Commonwealth heritage

The majority of listings on the Commonwealth heritage list under the historic classification which occur along the coastline of the OAs are lighthouses; these and the other listings are not considered relevant to this EP.

No historic indigenous Commonwealth-listed places are found within or near the OAs (Department of Prime Minister and Cabinet, 2019).

5.7.2.3 Natural

The closest natural heritage listing place to the OAs is Point Wilson, located in the Western Port Phillip Bay Ramsar Area (Victoria) and is not deemed relevant for this EP.

6 Relevant persons consultation

6.1 Purpose and scope

Over the past 50 years of operations in Bass Strait, Esso has established relationships with relevant persons identified in the Bass Strait Operations EP (AUGO-EV-EMM-002) and activity-specific EP submissions, as well as the broader public and other interested parties.

Esso recognises and respects the important contribution of relevant persons, including First Nations people, throughout offshore petroleum activities. Esso is committed to ensuring that relevant persons are identified and given sufficient information and reasonable time for consultation to allow them to make an informed assessment of the possible consequences of a proposed petroleum or greenhouse gas activity on them.

The consultation process outlined in this EP assists Esso to ascertain and understand the environmental impacts and risks that might arise from its proposed activity. The consultation process also allows Esso to receive information that the Company might not otherwise receive, and to use this information to enhance understanding of the environment, people, communities, heritage values, and social and cultural features that may be affected by the proposed activities and to inform decision-making.

For the purposes of this EP, Esso defines consultation as a process of communication that leads to a decision where the views of relevant persons have been taken into account. Engagement aims to build long term relationships by exchanging information. While Esso is required by legislation to consult with relevant persons, Esso is committed to engaging with new relevant persons and continuing to further develop relationships already established.

Esso will consider and adopt appropriate measures, in response to the matters raised by relevant persons, in the management of environmental impacts and risks as part of the EP development process.

This Section describes Esso's approach to consultation and engagement, and the steps the Company takes to develop and maintain consistent, constructive and effective relationships with relevant persons associated with this EP.

More specifically, this Section outlines in detail:

- Esso's objectives for consultation and engagement
- applicable consultation and engagement requirements and standards including Esso's definition of relevant persons to be consulted throughout the activities covered in this EP
- the methodology used to identify and engage relevant persons
- the relevant persons identified under the scope of this EP and the verification process applied
- communication and consultation methods used to ensure sufficient information is provided in relation to the scope of this EP
- how the consultation process is planned and tailored as appropriate to the nature and scope of this EP
- a description of consultations undertaken to-date
- a summary of how feedback received to-date have been considered, addressed and communicated.

Consultation and engagement with relevant persons is regarded as an ongoing process.

6.2 Objectives

The overall objectives of Esso's consultation and engagement activities, in relation to the activities described in this EP, are to:

- ensure every effort is made to identify relevant persons
- undertake a verification process to ensure all representatives of relevant persons are a true representation/advocate of the views of their constituents and can be relied upon to faithfully communicate the results of engagements back to their constituents
- ensure relevant persons, especially those who are directly impacted, are consulted on matters that may affect them
- develop and maintain consistent and constructive relationships with relevant persons with a genuine desire to further understand potential environmental, social and economic impacts
- pursue engagement with relevant persons using a level of effort commensurate with the nature and scale of the activity
- keep relevant persons informed with respect to their specific interests, functions or activities
- encourage relevant persons to assess the information provided to them and respond to Esso with any feedback including questions, issues, concerns, suggestions, objections and/or claims
- maintain confidence of relevant persons in Esso and its activities through ongoing open, informative, inclusive and timely communications, wherever possible.

Esso achieves these objectives by adhering to the following principles of:

- meeting regulatory obligations and aligning to industry best practice consultation and engagement methods
- reviewing and updating the consultation methodology to reflect any changes to applicable laws, best practices or standards
- providing meaningful information in a format and language that is readily understandable and tailored to the needs of relevant persons and groups
- providing information within an adequate timeframe to inform decision-making
- ensuring consultations are based on open communication that is transparent, collaborative, inclusive and are conducted with integrity to foster respect and trust
- disseminating information in formats, methods and locations that make it easy for relevant persons to access
- respecting local traditions and the relevant person's preferred ways of doing things
- establishing two-way dialogue that gives all relevant persons the opportunity to exchange views and information, to listen, and to have their feedback heard and addressed
- seeking inclusiveness in representation of views, including minority and special interest groups
- developing clear mechanisms for receiving, documenting, and responding to feedback
- incorporating feedback from relevant persons into the program design and providing clear and transparent reporting back to relevant persons in a reasonable timeframe.

6.3 Requirements and standards

Esso is committed to undertaking all consultation and engagement activities in accordance with applicable Australian legislation as outlined in Section 2 of this EP and ExxonMobil standards, which are defined in Section 6.3.2.

6.3.1 Legislative Requirements

For each EP, Esso undertakes consultation in accordance with the legislative requirements, including case law, as outlined in Table 6-1. Esso also considers relevant guidance, particularly the guidance of the Regulator, as shown in Table 6-2.

Table 6-1 Applicable Australian legislation and case law

Title	Applicable requirements	How Esso meets these requirements
Offshore Petroleum and Greenhouse Gas Storage Act 2006 **Section 280 and Section 460**	(2) A person (the first person) carrying on activities in an offshore area under the permit, lease, licence, authority or consent must carry on those activities in a manner that does not interfere with: (a) navigation; or (b) fishing; or (c) the conservation of the resources of the sea and seabed; or (d) any activities of another person being lawfully carried on by way of: (i) exploration for, recovery of or conveyance of a mineral (whether petroleum or not); or (ii) construction or operation of a pipeline; or (iii) offshore infrastructure activities (within the meaning of the *Offshore Electricity Infrastructure Act 2021*); or (e) the enjoyment of native title rights and interests (within the meaning of the *Native Title Act 1993*); to a greater extent than is necessary for the reasonable exercise of the rights and performance of the duties of the first person.	Consultation processes are designed to meet obligations under Section 280 and Section 460.
Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 **Regulation 3 - Object of Regulations**	The object of these Regulations is to ensure that any petroleum activity or greenhouse gas activity carried out in an offshore area is: (a) carried out in a manner consistent with the principles of ecologically sustainable development set out in section 3A of the EPBC Act; and (b) carried out in a manner by which the environmental impacts and risks of the activity will be reduced to as low as reasonably practicable; and	Consultation processes are designed in the context of the objects of Regulation 3

Title	Applicable requirements	How Esso meets these requirements
	(c) carried out in a manner by which the environmental impacts and risks of the activity will be of an acceptable level.	
Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 **Regulation 9 - Submission of an environment plan**	(8) All sensitive information (if any) in an environment plan, and the full text of any response by a relevant person to consultation under regulation 11A 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. Note: Subparagraph 16(b)(iv) requires the plan to contain a copy of the full text of any response by a relevant person to consultation under regulation 11A in the course of preparation of the plan.	Sensitive information relating to relevant persons and the full text of any response by a relevant person to consultation under Regulation 11A in the course of preparation of the EP, will only be included in the 'sensitive information part' and not anywhere else in the EP. The 'sensitive information part' is removed prior to publication in accordance with Regulation 9AB.
Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 **Regulation 10A - Criteria for acceptance of environment plan**	For regulation 10, the criteria for acceptance of an environment plan are that the plan: (g) demonstrates that: (i) the titleholder has carried out the consultations required by Division 2.2A; and (ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate;	This Chapter is intended to demonstrate how Esso has carried out the consultations required by Division 2.2A. Refer to Section 6.12 for a summary of the feedback received during the consultation process and any measures Esso has adopted resulting from the consultation process
Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 **Division 2.2A—Consultation in preparing an environment plan** **Regulation 11A - Consultation with**	(1) In the course of preparing an environment plan, or a revision of an environment plan, a titleholder must consult each of the following (a relevant person): (a) 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; (b) each Department or agency of a State or the Northern Territory which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant;	Esso categorises relevant persons into four categories aligned to Regulation 11A (1)((a-d), as shown in Section 6.10.4). Persons and organisations under Regulation 11A (1)(e) are considered during the process of identification of relevant persons, and if found to be a relevant person, are categorised into one of the four defined categories. As such, there is no need for a category aligned directly to Regulation 11A (1)(e).

Title	Applicable requirements	How Esso meets these requirements
relevant authorities, persons and organisations, etc	(c) the Department of the responsible State Minister, or the responsible Northern Territory Minister; (d) 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; (e) any other person or organisation that the titleholder considers relevant.	
	(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.	Esso defines ‘sufficient information’ to include: • sharing information that is tailored to a relevant persons’ needs • detailing the proposed activity and any impacts and risks that may be relevant to them • describing the control measures proposed to manage the potential impacts to them. Esso considers the functions, interests or activities of relevant persons and the impacts and risks that affect them when determining information requirements and acknowledges that information may need to be provided in an iterative manner.
	(3) The titleholder must allow a relevant person a reasonable period for the consultation.	Esso recognises that the time required for consultation varies depending on the individual circumstances of the relevant person, the proposed activity, the extent of potential impacts and risks on that relevant person, and the level of information that has been provided. Therefore, what is a reasonable period for

Title	Applicable requirements	How Esso meets these requirements
		consultation should be considered on a case-by-case basis but at a minimum allows sufficient time for: • a relevant person to assess information and provide a response detailing any feedback (Esso considers 30 days a reasonable time for the relevant person to indicate their interest or otherwise) • Esso to consider responses when developing the EP • Esso to reply to the relevant person addressing any feedback. In the event a reasonable period has been provided and no response is received, any subsequent response following submission of the EP will be addressed through Esso's ongoing engagement process, including revision to the EP if this is assessed as required (refer to Section 6.8).
	(4) The titleholder must tell each relevant person the titleholder consults that: (a) the relevant person may request that particular information the relevant person provides in the consultation not be published; and (b) information subject to such a request is not to be published under this Part.	Esso will inform each relevant person that they may request that particular information they provide in the consultation not be published. Esso is committed to honouring this request and will not publish information subject to such a request.
Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 **Regulation 14 - Implementation**	(9) The implementation strategy must provide for appropriate consultation with: (a) relevant authorities of the Commonwealth, a State or Territory; and (b) other relevant interested persons or organisations.	Esso ensures appropriate consultation is conducted with relevant authorities through their identification as relevant persons under Categories A, B and C (Refer to Section 6.10.4.1).

Title	Applicable requirements	How Esso meets these requirements
strategy for the environment plan		Other relevant interested persons or organisations are identified as relevant persons under Category D (Refer to Section 6.10.4.2). Esso also conducts broad-based information sharing engagements as outlined in Section 6.4
Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 **Regulation 16 - Other information in the environment plan**	The environment plan must contain the following: (b) a report on all consultations under regulation 11A of any relevant person by the titleholder, that contains: (i) a summary of each response made by a relevant person; and (ii) an assessment of the merits of any objection or claim about the adverse impact of each activity to which the environment plan relates; and (iii) a statement of the titleholder's response, or proposed response, if any, to each objection or claim; and (iv) a copy of the full text of any response by a relevant person;	Refer to Section 6.13
Tipakalippa v National Offshore Petroleum Safety and Environmental Management Authority (No. 2) [2022] FCA 1121 (Decision) Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 (Appeal)	The judgements from the Decision and Appeal are considered law and constitute the legal requirements of consulting with relevant persons	This Chapter is intended to demonstrate how Esso has consulted, in a way that complies with the judgements made in the Decision and the Appeal. Esso also implemented the guidance outlined in *Consultation in the course of preparing an environment plan* (NOPSEMA, 2022).

Table 6-2 Consultation-related guidance considered in the development of this EP

Guidance document	Scope
Consultation in the "course of preparing an environment plan (NOPSEMA, 2022)	This Guideline was developed by NOPSEMA to: "support clarity and transparency on the legal requirements, including recent case law, for consultation by titleholders in the course of preparing their Environment Plans prior to submission to NOPSEMA". It outlines how NOPSEMA has interpreted the Decision and Appeal. Key points include: • Regulation 11A creates an artificial definition of 'relevant person' which is broader than the usual legal meaning given to the term 'person'. For the purposes of regulation 11A(1)(d), while an individual person may be a relevant person, so too may an organisation. • The phrase "functions, interests or activities" in reg 11A(1)(d) should be broadly construed as this approach best promotes the objects of the Regulations, including that offshore petroleum and greenhouse gas activities are carried out in a manner consistent with the principles of ESD. • Functions: Refers to "a power or duty to do something" • Activities: To be read broadly and is broader than the definition of 'activity' in regulation 4 of the Environment Regulations 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" • A connection of traditional owners with sea country may constitute an interest for the purposes of reg 11A(1)(d) • Titleholders must demonstrate to NOPSEMA that a reasonable opportunity to participate has been afforded to First Nation groups.
Environment Plan Assessment (NOPSEMA, 2020)	Describes NOPSEMA's administration of the regulations that relate to EPs to ensure a documented, systematic and consistent approach to assessment and decision-making.
Environment Plan decision making (NOPSEMA, 2021)	Sets out NOPSEMA's considerations in making decisions in accordance with the legislated criteria relevant to EPs.
Environment plan content requirement (NOPSEMA, 2020)	Aims to assist titleholders in understanding the requirements for preparing and submitting an EP for assessment.

Guidance document	Scope
Native Title Act 1993	In the Appeal (Paragraph 96 & 104), The Federal Court has noted that there is no shortage of guidance in decisions on consultation processes under *the Native Title Act 1993* (NT Act) which is illustrative of how a seemingly rigid statutory obligation to consult persons holding a communal interest may operate in a workable manner. The NT Act authorities require reasonable notice to group members, but not exhaustive communications with each and every person.

6.3.2 ExxonMobil standards

The ExxonMobil OIMS requirements that apply to stakeholder engagement and grievance management are outlined in Table 6-3.

Table 6-3 OIMs Systems applicable to stakeholder consultation

OIMS System number	OIMS System title	Description of requirements
1-1	Management Leadership, Commitment and Accountability	Managers and supervisors demonstrate commitment and personal accountability through active and visible participation.
2-1	Risk Assessment and Management	The requirement to identify and manage risks.
4-2	Compliance with Laws, Regulations and Permits	The requirement to comply with applicable laws, regulations, permits, licences, and other legally binding requirements or agreements.
6-5	Environmental Management	The requirement to identify and assess significant environmental aspects (including socioeconomic) and to develop mitigations.
10-1	Community Awareness	The requirement that addresses communication and interaction with employees, contractors, government, law enforcement officials, non-government organisations, the media, and local communities where office and field/plant operations could have an impact on communities. The review of grievances and issues is a required activity within this element.
11-1	OIMS Assessment	The requirement for periodic internal and external assessment of the performance of the OIMS Systems.

In addition, the *ExxonMobil Upstream Socioeconomic Management Standard* (ExxonMobil, 2021a) provides guidance on how socioeconomic issues will be identified, with specific consideration given to:

- consultation with relevant communities, government officials, and appropriate stakeholder organisations or individuals to share information, solicit opinions/ideas/feedback, and respond to expressed concerns
- identification of potential socioeconomic issues and risks including, but not limited to, management of cultural and heritage properties, interaction with Indigenous and/or vulnerable populations, compensation, employment and training, and the procurement of goods and services
- development of appropriate prevention (or enhancement), control and monitoring strategies related to potential socioeconomic issues and impacts.

6.4 Engagement Mechanisms

Esso uses different mechanisms throughout the consultation process to engage with relevant persons. Where possible the method most appropriate and/or has been requested by the relevant persons is used.

Given the nature of consultation, the process will always be context-specific, meaning that techniques, methods, approaches and timetables will be tailored to the issue, to the situation and to the relevant persons being consulted. At all times the provision of sufficient information is the focus.

Direct engagement mechanisms typically used by Esso to communicate with relevant persons include:

- in-person discussions and presentations
- community sessions
- presentations at committee meetings
- formal and informal meetings
- phone calls
- video meetings
- email correspondence.

Wherever possible, Esso aims to conduct face-to-face consultations with relevant persons in a location within the relevant persons' community in a venue where they feel comfortable. Such locations and venue considerations can assist to:

- make consultation convenient for the relevant person
- lend transparency to the process
- increase accountability of local leaders
- demonstrate that Esso values the input of local communities
- contribute to a relevant persons' feeling of ownership over the consultation process
- allow relevant persons to identify their own representatives, preventing illegitimate representatives from claiming that they speak for them.

All consultations are undertaken with respect to the physical, environmental and cultural sensitivities of relevant persons.

6.5 Timing of consultation

The time required for consultation varies depending on the individual circumstances of the relevant persons, the proposed activity, the extent of potential impacts and risks on that relevant person, and the level of information that has been provided. For example, in some cases where relevant persons have not responded to repeated direct consultation efforts such as letters, emails and phone calls, Esso aims to indirectly engage them through mutual third party stakeholders. This has been the case in some instances, whereby Esso continues to work with mutual third parties to establish effective engagement and achieve consultation and feedback with all relevant persons.

6.6 Planning and preparation

Based on the nature, scale and complexity of the proposed activity, as well as the extent and severity of potential impacts and risks on a relevant person's functions, interests or activities (NOPSEMA, 2022), Esso determines which direct and indirect engagement mechanisms would be best suited and develops a preliminary engagement plan. Esso also defines a reasonable period for consultation, in accordance with the definition provided in Table 6-1.

Esso then prepares communication materials required to support the identified engagement mechanisms. Regardless of the scope of the EP, communication materials will always include, as a minimum:

- a fact sheet, information bulletin or similar, that includes 'sufficient information' (in accordance with the definition provided in Table 6-1) on the activity proposed in the EP
- a Relevant Person Questionnaire (see 6.7.5.1).

6.7 Methodology

When preparing EPs, relevant persons are identified, verified and consulted, and their feedback is obtained to inform decision-making and planning for proposed activities, as summarised in Figure 6-1 and detailed in the following sections.

This methodology applies to each EP developed by Esso. For specific information on how this process was undertaken in relation to this EP, refer to Section 6.10.

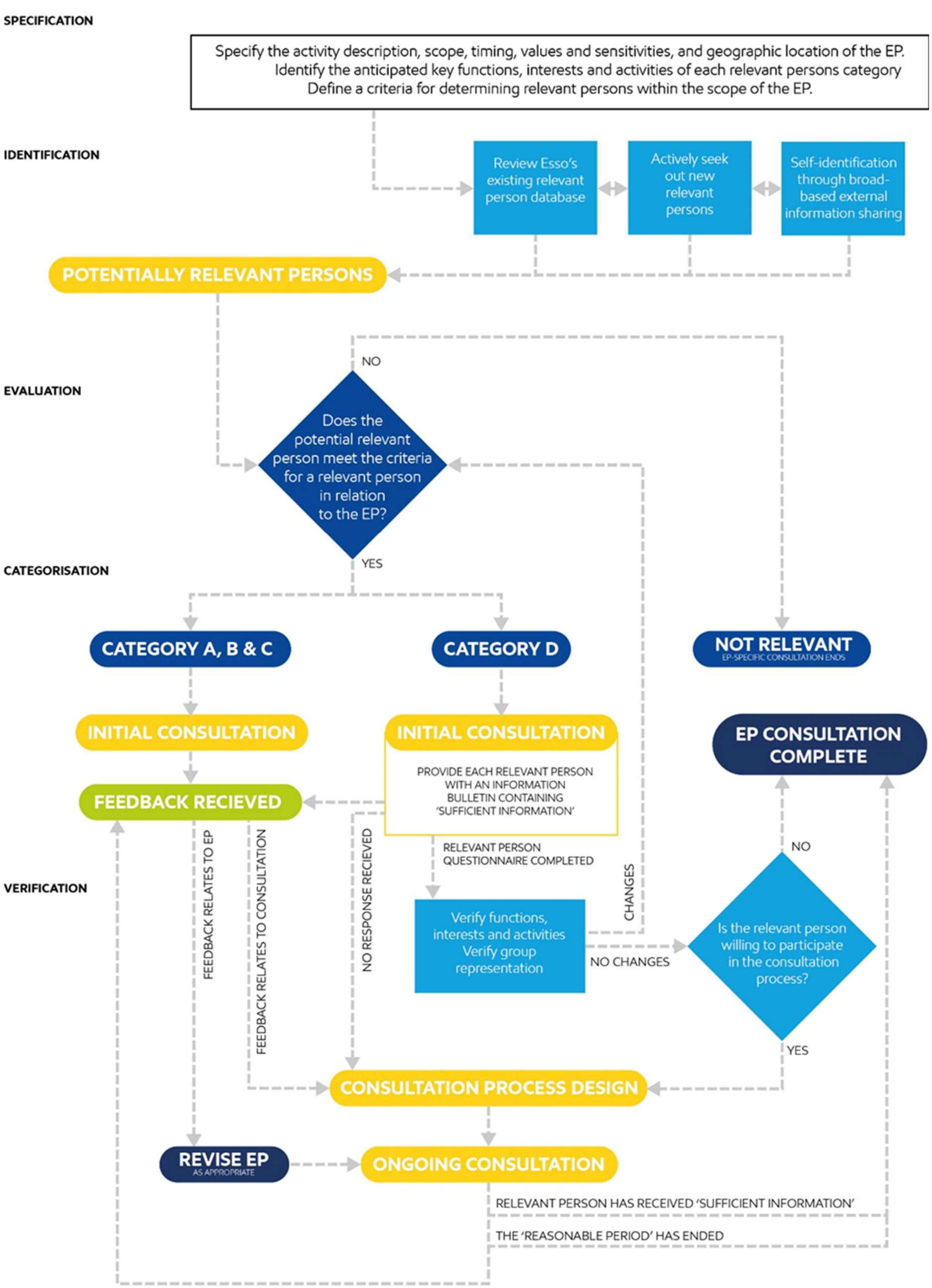


Figure 6-1 Consultation methodology

6.7.1 Specification

To identify relevant persons, Esso must first outline the EP specifications for:

- activity description, which is compared to previous consultations undertaken for other Esso activities and/or facilities. For example, previous consultations have been held with relevant persons to develop and refine EPs for Bass Strait Operations, West Barracouta field production, Gudgeon-1 and Terakihi-1 plug and abandonment and Jack Up Rig activities
- scope of the EP, taking into consideration factors such as potential impacts to environmental factors including air and water emissions, culturally sensitive areas, sea country and marine environments; and potential socioeconomic impacts including job creation throughout the supply chain
- values and sensitivities of the proposed activity, including cultural heritage (world, national and local), sea country, wetlands of international significance (Ramsar), listed threatened species and listed migratory species, listed threatened ecological communities and Commonwealth marine areas
- timing of the proposed activity, including any seasonal changes
- geographic location of the activity, including not just primary project sites but also related facilities, transport routes, cumulative impacts and sea country.

Considering these specifications, Esso then identifies the anticipated key functions, interests and activities of each relevant persons category and defines criteria for determining relevant persons within the scope of the EP.

6.7.2 Identification

Esso is required to identify, on a case-by-case basis, and consult with each authority, person or organisation who falls within the categories of relevant persons set out in Regulation 11A. To achieve this, Esso must first clearly identify who is a relevant person.

6.7.2.1 Relevant persons previously identified for other activities

Esso has a history of extensive and ongoing consultation for offshore activities in the Bass Strait spanning more than 50 years. As such, identification of relevant persons starts with a review of Esso's existing relevant persons database to generate a list of any persons, groups, and organisations who may be relevant to the activity proposed in the respective EP.

6.7.2.2 Actively seek out new relevant persons

To ensure the broad capture of ascertainable persons and organisations who may have their functions, interests or activities affected by the activity (Santos NA Barossa Pty Ltd v Tipakalippa, 2022), Esso seeks to identify any new relevant persons through:

- using local knowledge of existing relationships to identify marine users and interest groups active in the area (e.g. First Nations, commercial fisheries, recreational fishers, other energy producers, local business, etc.)
- seeking the advice of First Nations groups such as land councils and prescribed body corporates in relation to who and how other First Nations groups or individuals should be consulted as relevant persons whose interests may be affected by the activities
- searches of internet sources, including google, social media platforms etc.

- members of the Company's local workforce providing suggestions of other potentially impacted relevant persons
- identified relevant persons providing recommendations of other potentially impacted relevant persons, through direct engagement and/or Relevant Person Questionnaire (see Section 6.7.5.1)
- advertisements in newspapers and other relevant news sources (e.g. *Koori Mail*, local papers)
- a review of legislation applicable to petroleum and marine activities
- active participation in industry bodies and collaborations e.g. Australian Petroleum Production and Exploration Association, Centre for Decommissioning Australia, National Energy Resources Australia, and the National Decommissioning Research Initiative
- leveraging existing relationships with relevant Commonwealth and State departments and agencies to identify other relevant stakeholders
- reviewing the relevant persons identified for other oil and gas EP's in the area
- any other person or organisation that Esso considers relevant, in accordance with Regulation 11A (1)(e).

Potential relevant persons identified through these means are added to the list generated by the review of the relevant persons database (per Section 6.7.2.1).

6.7.2.3 Self-identification through broad-based information sharing

As part of the Company's own commitments to consultation and engagement, Esso regularly conducts broad-based information sharing designed to reach both relevant persons identified for any EP and a broad range of other interested parties. This broad-based information sharing allows Esso to create awareness of its activities and encourages potentially relevant persons to make themselves known to the Company (NOPSEMA, 2022). Any persons or organisations who self-identify are added to the list generated by the ongoing review of the relevant persons database (per Section 6.7.2.1).

6.7.2.4 First Nations people

Esso recognises First Nations people as the Traditional Custodians of the land and waters in which the company operates and acknowledges and pays respect to their Elders – past, present and emerging.

Esso understands that First Nations people see no distinction between the land and the sea, considering it all as a part of their Country.

6.7.2.4.1 Native Title

The landmark judgements in *Mabo v Queensland (No 2)* (1992) 175 CLR 1 was the first time Indigenous people's assertions of inherited rights to land were recognised by Australian law. The judgements of the High Court overturned the legal fiction of terra nullius (land belonging to no one), and acknowledged that Indigenous people had, and still have, laws and cultural practices, relating "to land ownership, management and resource use that survived the process of British colonisation. This recognition of Indigenous "native title" was then formally embraced in statutory law through the *Native Title Act 1993*.

On 22 October 2010, the Federal Court recognised that the Gunaikurnai people hold native title over much of Gippsland.

On the same day, the State entered into an agreement with the Gunaikurnai people under the *Traditional Owner Settlement Act 2010*. The agreement between the State and the Gunaikurnai people was the first to be made under the *Traditional Owner Settlement Act 2010*.

The agreement area extends from West Gippsland, near Warragul, east to the Snowy River and north to the Great Dividing Range. It also extends 200 metres offshore. The determination of native title under the *Native Title Act 1993* covers the same area. Both the agreement and the native title determination only affect Crown land within this area.

As part of the agreement, the Gunaikurnai people will be able to undertake traditional activities such as hunting, fishing and gathering for traditional, non-commercial, domestic or communal purposes. This will involve recreational fishing and game hunting without a licence, as long as the Gunaikurnai people comply with relevant laws and regulations (including any catch limits).

Native title also provides the Gunaikurnai people with the right to negotiate with anyone seeking to carry out activities that might affect their rights. These rights do not impact access for existing users of the area, such as recreational fishers and hunters. The agreement does not provide the Gunaikurnai people with any commercial hunting, fishing or forestry rights.

However, in Akiba on behalf of the *Torres Strait Regional Seas Claim Group v Commonwealth of Australia* [2013] HCA 33, the High Court said that the native title claim group had the right 'to take for any purpose resources in the native title areas'. This meant that the native title holders could continue to sell and trade fish as they had done under their traditional laws. It was the first time that native title rights were found to include commercial rights.

As a prescribed body corporate under the *Native Title (Prescribed Body Corporate) Regulations 1999*, the Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC) is empowered to make native title decisions and negotiate agreements on behalf of the Gunaikurnai native title holders. GLaWAC must undertake a process of consultation and consent with native title holders as part of that agreement-making process.

The Gunaikurnai people lodged a native title determination application in the Federal Court on 9 December 2014 under the *Native Title Act 1993*. The application included the land and waters west of the Gunaikurnai determination area to the Tarwin West River, including Wilsons Promontory and Cape Liptrap. The Gunaikurnai name for this area, Yiruk, means rocky place. In September 2019, the Gunaikurnai withdrew the claim.

Esso acknowledges that, despite the claim withdrawal, the Gunaikurnai people hold strong connections to Yiruk with a long history of association with and caring for country, and they will continue to assert their rights and interests over this area.

As part of the Gunaikurnai people's native title, the following national parks and reserves are classified as Aboriginal title and subject to joint management between the State and the Gunaikurnai Traditional Owner Land Management Board:

- The Knob Reserve, Stratford
- Tarra Bulga National Park
- Mitchell River National Parks
- Lakes National Park
- Gippsland Lakes Coastal Park
- New Guinea Cave (within Snowy River National Park)
- Lake Tyers Catchment Area

- Buchan Caves Reserve
- Gippsland Lakes Reserve at Raymond Island
- Corringle Foreshore Reserve.

6.7.2.4.2 Sea Country

In April 2021, the Sea Country Indigenous Protected Areas (IPA) Program was established by the Australian Government to strengthen the conservation and protection of Australia's unique marine and coastal environments, while creating employment and economic opportunities for Indigenous Australians. Under the program, grant funding will be provided to Indigenous organisations to expand existing IPAs and create new IPAs. The Government will also support delivery of the program, including the development of a Sea Country IPA monitoring and evaluation system and the holding of a conference of Indigenous land and sea managers so they can share knowledge and experiences.

On 7 May 2022, 10 successful Sea Country IPA consultation projects were announced, including the Nanjit to Mallacoota Sea Country IPA managed by GLaWAC.

The Nanjit to Mallacoota Sea Country IPA is in coastal waters of the Gippsland region in Victoria from Nanjit, east of Wilsons Promontory, to Mallacoota, on the Victoria/New South Wales Border. The area comprises numerous marine and coastal parks and includes the Ramsar-listed Gippsland Lakes and Raymond Island.

A Nanjit to Mallacoota Sea Country IPA Management Plan is being developed to support First Nations people to identify cultural and natural values, including the condition and any threats to these values, and plan for the conservation and management of these values.

GLaWAC is partnering with Monash University and the Arthur Rylah Institute to undertake specific research into culturally significant areas and species that occur along the coast.

While the plan is being developed, Esso has anticipated the values and sensitivities regarding Sea Country to potentially include:

- geographical features
- places with cultural and/or spiritual significance
- flora and fauna species that have a cultural and/or spiritual significance
- cultural harvesting and use of flora and fauna.

Esso has registered an interest to participate in the Nanjit to Mallacoota Sea Country IPA consultation project and understands that once the First Nations peoples consultation phase has completed, commercial participants will be approached.

6.7.2.5 Environmentally focused non-government organisations and other environmental protection and advocacy groups

Despite fundamental differences in views preventing productive engagement in the past, Esso continues to identify and attempt consultations with environmentally focused non-government organisations (eNGOs) and other environmental protection and advocacy groups.

6.7.3 Evaluation

Esso acknowledges that factors such as the nature of the activity, the environment in which the activity is being undertaken and the possible impacts and risks of the activity should be taken into account when determining whether the activity may be relevant to authorities, or determining who has functions, interests or activities that may be affected (NOPSEMA, 2022).

To address this, each entry on the list of potential relevant persons is evaluated to confirm that it meets the criteria for a relevant person in relation to the respective EP. This evaluation involves identifying (if not previously engaged as a relevant person) and analysing the reasonably ascertainable functions, interests and activities of each person/group/organisation taking into account the specifications defined in Section 6.7.1.

In some cases, relevant persons have developed guidance detailing their own functions, interests or activities and how and when they wish to be consulted on activities (NOPSEMA, 2022), which will be considered throughout the process. This includes, for example:

- Consultation with Commonwealth agencies with responsibilities in the marine area (NOPSEMA, 2022)
- Engage Early Guidance for proponents on best practice Indigenous engagement for environmental assessments under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Department of Environment, 2016).

Once completed, the evaluation yields a confirmed list of relevant persons relevant to the respective EP.

6.7.4 Categorisation

Each entry on the list of relevant persons is categorised into one of four categories, aligned to Regulation 11A (1)(a-d),as follows:

- **Category A** – Each Department or agency of the Commonwealth to which the activities to be carried out under the EP may be relevant. For Esso's operations in Bass Strait, this includes any Commonwealth department or agency that has responsibility for managing or protecting the marine environment from pollution. It may also include those with responsibilities for environmental and fisheries management, defence and communications, maritime/navigational safety, marine parks, and native title. For the purposes of this EP, it is noted that there is no spill risk scenario.
- **Category B** – Each Department or agency of a State or the Northern Territory to which the activities to be carried out under the EP may be relevant. For Esso's operations in Bass Strait, this includes any Victorian government department or agency that has responsibility for managing or protecting the marine environment from pollution. It may include those with responsibilities for environmental and fisheries management, defence and communications, maritime/navigational safety, marine parks, and native title. For the purposes of this EP, it is noted that there is no spill risk scenario.
- **Category C** – The Department of the responsible State Minister, meaning the Victorian Government department that has responsibilities for offshore petroleum or energy resources i– Victoria. For Esso's operations in Bass Strait, this is Victoria's Department of Energy, Environment and Climate Action (DEECA) - Earth Resources.
- **Category D** – A person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the EP. A connection of traditional owners with sea country may constitute an interest for the purposes of Category D categorisation. For Esso's operations in Bass Strait this includes First Nations groups, non-government organisations, worker unions and fishing groups. It may also include community groups and individuals.

6.7.5 Verification

Following identification, evaluation and categorisation of relevant persons, Esso undertakes a process of verification for Category D relevant persons, which aims to ensure that:

- the functions, interests and activities used to evaluate and categorise the person or organisation as a relevant person are confirmed
- identified representatives are a true representation/advocate of the views of their constituents and can be relied upon to faithfully communicate the results of engagements back to their constituents
- relevant persons are willing to participate in the consultation process.

6.7.5.1 Verifying functions, interests and activities

Category D relevant persons (or their verified representative) will be provided with:

- an information bulletin (or similar) providing sufficient information on the activity proposed in the EP
- a Relevant Person Questionnaire which is tailored to the scope of the relevant EP.

The information bulletin aims to ensure all relevant persons are provided with sufficient information at the outset of the consultation process so they can make informed decisions about their participation or otherwise. This information bulletin will be in the form of a brochure or link to a specific webpage.

One aim of the Relevant Person Questionnaire is to verify the functions, interests and activities of each relevant person. This is achieved through providing a tailored list of functions, interests and activities (relevant to the EP) so that the relevant person can select one or more items. Esso then compares the functions, interests and activities nominated by the relevant person against the functions, interests and activities used to determine their status as a relevant person (see Section 6.7.3). Should there be any discrepancies, Esso updates the relevant persons database and may re-evaluate the person’s/group’s status as a relevant person.

6.7.5.2 Verifying true representation

The Relevant Person Questionnaire is also used to determine the group participation of individual relevant persons. This information is used to develop a list of group members that Esso can engage with directly to seek verification that the right group representatives have been identified. This ground-truthing of views of the designated representatives is essential to confirm they will provide a comprehensive and accurate representation. The Questionnaire also allows for individual relevant persons to choose whether they want to be consulted with directly or if their preference is for Esso to consult with the group representative on their behalf.

6.7.5.3 Confirming participation

Provision is made in the Questionnaire to allow for a relevant person to ‘opt out’ of the consultation process. Esso will respect the wishes of the relevant person should they choose to ‘opt out’. Where a Relevant Person Questionnaire has not been completed and returned, this will not be considered ‘opting out’ and Esso representatives will seek to make further contact with the relevant person to obtain a response, as appropriate.

It is recognised that in any community consultation there will inevitably be persons who cannot participate for various reasons, however the absence of their participation would not invalidate the process provided reasonable efforts are made to identify the relevant persons and to consult with them (NOPSEMA, 2022).

6.7.6 Consultation process design

Esso seeks to engage with relevant persons so that each relevant person has sufficient information to understand the activity and to help them make an informed assessment of possible consequences associated with the EP activities pursuant to their own functions, interests or activities. Esso acknowledges that what constitutes sufficient information as part of a consultation process may differ depending on the relevant person(s) (NOPSEMA, 2022). As such, Esso seeks to consult in a way that is appropriate for each relevant person and adapted to the nature of the relevant persons to be consulted.

To achieve this, the consultation process is tailored to the requirements of relevant persons by obtaining feedback, which allows the relevant person to:

- subscribe to Esso's other broad-based information sharing communications
- nominate how they prefer to be communicated with
- provide any feedback.

The results of the Relevant Person Questionnaire are entered into Esso's relevant persons database and used to:

- align delivery of planned engagement mechanisms and materials to the requests of relevant persons
- develop additional materials and/or conduct additional engagements in response to relevant person feedback
- be considerate of the level of participation requested by each relevant person
- take into account any views of what constitutes reasonable timeframes, availability and or accessibility issues offered by relevant persons.

Each consultation has the overarching goals of:

- further strengthening foundation relationships with existing relevant persons
- developing relationships with new relevant persons
- facilitating genuine two-way dialogue between Esso and relevant persons, where supported by both parties
- building upon preceding consultations (where applicable) to further a relevant person's understanding of the activity.

Throughout the consultation process, relevant persons are invited to correspond with Esso if they have concerns or require clarifications. Follow up verbal discussions occur where required or if requested.

Esso will ensure a reasonable opportunity to participate has been afforded to groups where interests are held communally, such as First Nation groups (Santos NA Barossa Pty Ltd v Tipakalippa, 2022). To do this, Esso will ensure reasonable notice is provided to group members and reasonable efforts are made to notify group members of the consultation in clear, simple and directly expressed terms (NOPSEMA, 2022).

Esso also provides avenues for relevant persons to contact Esso outside of formal engagement activities if they have any questions or concerns. If needed, Esso will engage an expert third party to provide support or assistance to relevant persons in relation to understanding the technical data.

6.8 Ongoing engagement

Esso recognises the importance of ongoing identification, consultation and engagement with relevant persons. It is anticipated that further ongoing consultations, at any stage, can and will be conducted for as long as is necessary to ensure relevant persons remain engaged, have any issues, concerns or objections addressed and are consulted on any changes or new developments relating to the EP. The decommissioning of Esso's Bass Strait assets will take many years and will involve an extended period of engagement and consultation with relevant persons.

6.9 Record keeping and reporting of relevant persons information

Esso maintains a Gippsland-wide relevant persons database. Communications, including meetings, calls, distribution of communications materials, emails etc., with relevant persons are logged in the database, detailing any feedback received, including questions, issues, concerns, suggestions, objections and/or claims, and any actions/responses. Actions are tracked and feedback is provided to relevant persons as required.

During all communications, Esso encourages relevant persons to provide feedback through:

- Emailing the consultation@exxonmobil.com email address
- calling +61 3 9261 0000
- or writing to GPO Box 400 Melbourne VIC 3001.

A report on all consultations between the Company and any relevant person is included in the relevant EP.

6.10 Methodology as applied to the scope of this Environment Plan

In response to the instructive reasons given by the Full Federal Court of Australia in its appeal decision on 2 December 2022 (Santos NA Barossa Pty Ltd v Tipakalippa, 2022) and subsequent NOPSEMA guidance on *Consultation in the course of preparing an environment plan* (NOPSEMA, 2022), Esso revised its consultation methodology in January 2023 and recommenced the consultation process in accordance with the revised methodology (refer to Section 6.7).

This section demonstrates how Esso applied the updated consultation methodology specifically to this EP and how the Company ensured the consultations were appropriate and adapted to the nature of the interests of the relevant persons.

6.10.1 Specifications

For the decommissioning of Campaign #1 Steel Piled Jackets, Esso has outlined the following specifications, which were the basis for determining the anticipated key functions, interests and activities of each relevant persons category and defining criteria to determine categorisation as a relevant person within the scope of this EP:

- **Activity description**: Refer to Section 4.
- **Scope:** Refer to Section 1.2.
- **Timing:** Refer to Section 1.3.

- **Values and sensitivities:** Refer to Section 5.4 to Section 5.7.
- **Geographic location:** For the purposes of consultation, the geographic location used to determine the relevant persons includes the broader Gippsland community including Lakes Entrance, Sale, Lake Tyers and surrounding areas. Portions of New South Wales and Tasmania have been included as they are noted in the Bass Strait EP as oil spill response areas, however it is noted that there is no hydrocarbon spill scenario associated with the activities in this EP.

Table 6-4 shows the criteria Esso has defined to determine a status as a relevant person within the scope of this EP.

Table 6-4 Relevant persons criteria

Criteria to determine relevant persons for this EP	Applicability to OAs	Relevant persons Category			
		A	B	C	D
World Heritage areas	Nil				
National Heritage Areas	Nil				
Wetlands of International Importance (Ramsar)					
Gippsland Lakes Ramsar Site	Nil				
Listed Threatened Species and Listed Migratory Species					
Fauna	✓				✓
Listed Threatened Ecological Communities					
Littoral Rainforest and Coastal Vine Thicket	Nil				
Subtropical and Temperate Coastal Saltmarsh	Nil				
Giant Kelp Marine Forests of Southeast Australia	Nil				
Commonwealth Marine Areas (Australian marine parks)					
East Gippsland Marine Park	Nil				
Beagle Marine Park	Nil				
South-east Marine Region	Nil				

Criteria to determine relevant persons for this EP	Applicability to OAs	Relevant persons Category			
		A	B	C	D
Commonwealth Marine Areas (KEFs)					
Upwelling East of Eden	✓				✓
Big Horseshoe Canyon	Nil				
Shelf Rocky Reefs	Nil				
Bass Cascade	Nil				
Other Protected Areas					
Social/Cultural/Conservation					
National Parks and Reserves	Nil				
Cultural - Indigenous Heritage					
Indigenous Protected Areas	Nil				
Commonwealth Heritage Listed Natural place					
Natural Heritage Place	Nil				
Commonwealth Heritage Listed Historic place					
Nil	Nil				
Historic Maritime					

Criteria to determine relevant persons for this EP		Applicability to OAs	Relevant persons Category			
			A	B	C	D
Historic Shipwrecks		Nil				
Environmental Values - Other						
Socio-Economic Environment						
Commercial Fishing	Commonwealth Fisheries: • Bass Strait Central Zone Scallop • Eastern Tuna and Billfish Fishery • Small Pelagic Fishery • Southern and Eastern Scalefish and Shark Fishery • Southern Bluefin Tuna Fishery • Southern Squid Jig Fishery.	✓	✓			✓
	State Fisheries – Victoria: • Ocean General Fishery • Purse seine (ocean) Fishery • Trawl (inshore fishery) • Giant Crab Fishery • Octopus (Eastern Zone) Fishery • Bait (General) Fishery • Rock Lobster Fishery • Scallop Fishery	✓		✓		✓

Criteria to determine relevant persons for this EP		Applicability to OAs	Relevant persons Category A	B	C	D
	• Wrasse (Ocean) Fishery • Commercial Bay and Inlet Fisheries.					
	State Fisheries – New South Wales: • Abalone Fishery • Estuary General Fishery • Estuary Prawn Trawl Fishery • Lobster Fishery • Ocean Hauling Fishery • Ocean Trap and Line Fishery • Ocean Trawl Fishery • Sea Urchin and Turban Shell Restricted Fishery.	Nil				
Oil and Gas		✓				✓
Shipping		✓				✓
Defence		Nil				✓
Potential Future Industries (i.e. wind energy)		✓				✓
Cultural						
Native Title		Nil				✓
Sea Country (Gurnaikurnai)		✓				✓

Criteria to determine relevant persons for this EP	Applicability to OAs	Relevant persons Category			
		A	B	C	D
Social Environment					
Recreational fishing, boating and leisure	Nil				✓
Potential Impacts					
Change to the function interests or activities of other users (commercial fishing)	✓	✓	✓		✓
Change to the function interests or activities of other users (recreational fishing, diving, boating)	✓				✓
Change to the function interests or activities of other users (future industries)	✓	✓			✓
Injury/mortality of fauna (long term degradation of infrastructure remaining in place)	✓	✓	✓		✓
Change in marine habitat (degradation/collapse of infrastructure remaining in place)	✓	✓	✓		✓
Injury/mortality of marine fauna (dredging of the seabed to allow cutting of piles)	✓	✓	✓		✓
Change in water quality (dredging of the seabed to allow cutting of piles)	✓	✓			✓
Injury/mortality of fauna (placement of SPJ sections on the seabed)	✓	✓			✓
Change in marine habitat (placement of SPJ sections on the seabed)	✓	✓			✓
Change in water quality (placement of SPJ sections on the seabed)	✓	✓			✓
Indirect environmental impacts (transport of removed sections of SPJs onshore)	✓		✓	✓	✓
Indirect environmental impacts (dismantling of removed section of SPJs onshore)	✓		✓		✓

Criteria to determine relevant persons for this EP	Applicability to OAs	Relevant persons Category			
		A	B	C	D
Indirect environmental impacts (waste disposal and resource recovery)	✓		✓		✓
Risks					
Unplanned interaction of remaining infrastructure with shipping vessel	✓	✓			✓
Unplanned interaction of remaining infrastructure with commercial fishing equipment	✓	✓	✓		✓
Introduction and spread of invasive marine species	✓	✓	✓		✓
Functions					
• Commonwealth departments that are responsible for administering, regulation or other oversight functions in relation to the: • OPGGS Act • OPGGS (Environment) Regulations • EPBC Act. • Organisations or agencies responsible for management of activities in Commonwealth waters including: • commercial fishing • navigation • maritime safety • vessel marine pest and biosecurity • maritime aviation search and rescue. • Organisations or agencies responsible for environmental protection including: • protection of the marine environment • marine pollution		✓			

Criteria to determine relevant persons for this EP	Applicability to OAs	Relevant persons Category			
		A	B	C	D
◦ management of Commonwealth reserves and conservation zones ◦ management of marine protected areas. • Commonwealth departments that are responsible for: ◦ economic growth ◦ energy, oil and gas and resources sectors.					
• Victorian government departments that are responsible for: ◦ economic growth ◦ climate change ◦ environment ◦ marine pollution ◦ agriculture and biosecurity ◦ oil spill response ◦ fisheries resources ◦ energy, oil and gas and resources sectors. • Port authorities for Gippsland. • State government departments of New South Wales and Tasmania with responsibilities relevant to oil spill response.			✓		
• Victoria's Regulator for exploration, mining, quarrying, petroleum, recreational prospecting and other earth resources activities.				✓	
• Land or waterway management organisations whose scope lies within the defined geographic location.					✓
• Local councils and authorities with jurisdiction over land within the geographic location.			✓		✓

Criteria to determine relevant persons for this EP	Applicability to OAs	Relevant persons Category			
		A	B	C	D
• State government agencies and authorities with jurisdiction over land and waterways within the geographic location.					
• Future users of an area within the defined geographic location with a potential impact from Esso's activities.					✓

• Community groups located, representing or with interest in the defined geographic location.
• Organisations involved in the oil and gas industry, with interests based in the defined geographic location, who:
  • operate as an oil and gas company
  • provide services or products to an oil and gas company.
• Media groups, publications and other related organisations with interests in the defined geographic location or in Esso's activities.
• Persons and/or organisations who have shown interest in Esso's activities through past engagements for other Esso activities in Bass Strait or by contacting Esso directly.
• Non-oil and gas-related energy projects such as carbon capture and storage and wind power generation programs.
• Energy, oil and gas and environmental industry organisations with interest in the geographic location.
					✓

Activities					
• Participation or representation within a fisheries group or seafood industry entity that operates within or represents persons located in the defined geographic location. • Businesses operating within the defined geographic location whose activities relate to fishing, boating, marine supplies or other users of the sea. • Businesses operating within the defined geographic location with an interest in or potential impact from Esso's activities.					✓

Criteria to determine relevant persons for this EP	Applicability to OAs	Relevant persons Category			
		A	B	C	D
• Recreational organisations whose recreational activities involve the waters within the defined geographic location. • Workers involved in Esso's Bass Strait activities. • Residents within the defined geographic location with an interest in or potential impact from Esso's activities. • Communities and community groups, within the defined geographic location, with an interest in Esso's activities.					
• Businesses operating within the defined geographic location. • Business and organisations whose services and/or products relate to marine operations such as oil spill response, maritime safety etc. • Persons and/or organisations with a recreational interest in the defined geographic location. • First Nations people and/or their representatives, identified as traditional landowners of land within the defined geographic location					✓

6.10.2 Identification of relevant persons

To identify relevant persons for this EP, Esso used the methods as outlined in Table 6-5.

Table 6-5 Relevant persons identification methods

Method	Description	Findings
Relevant persons previously identified for other activities		
Review of Esso's existing stakeholder database	Identify existing stakeholders based on: • OPGGS (Environment) Regulations, Regulation 11A • geographic location • reasonably ascertainable functions, interests or activities.	85 existing relevant persons may be considered relevant persons within the scope of this EP.
Actively seek out new relevant persons		
Local knowledge	Use local knowledge of existing relationships to identify marine users and interest groups active in the area. In-person consultation with the Lakes Entrance Visitor Centre to discuss and identify potentially relevant groups or individuals that may be relevant across a broad spectrum including First Nations and local environmental groups.	13 new potentially relevant persons identified.
Identify marine users and interest groups active in the area	Gather a list of commercial fisheries, recreational fishers, other energy producers, local business, etc.	Confirmed that individual commercial fishers represented by the SETFIA organisation did not want to be consulted as individuals, but rather via SETFIA.
Legislation review	Review legislation applicable to petroleum and marine activities.	No new potentially relevant persons identified.
Industry bodies	Active participation in industry bodies and collaborations e.g. Australian Petroleum Production and Exploration Association, Centre for Decommissioning Australia, National Energy Resources Australia, and National Decommissioning Research Initiative.	No new potentially relevant persons identified.
Leveraging existing relationships	Leveraging existing relationships with relevant Commonwealth and state departments and agencies, as well as relevant persons identified for other activities in the area, to identify additional relevant persons.	No new potentially relevant persons identified.

Method	Description	Findings
Community sessions	Consider the attendees of community sessions	11 new potentially relevant persons were identified and indicated they would like to be consulted on decommissioning activities. All community session attendees that indicated they would like to be consulted were included as relevant persons.
Searches of internet sources	Google, social media platforms	6 new potentially relevant persons identified.
Recommendations	Consider recommendations received from relevant persons	1 new potentially relevant person identified.
Advertisements in newspapers and other relevant news sources	Advertised in national, state, regional and local papers including *Koori Mail*.	11 new potentially relevant persons identified (who then attended the community session where relevant person status was confirmed).
Review of legislation applicable to petroleum and marine activities	Following on from (Santos NA Barossa Pty Ltd v Tipakalippa, 2022) Esso conducted a further review of worker unions, eNGOs, First Nations groups and communities within the geographic boundary of the PEA.	19 new potentially relevant persons identified.
Self-identification		
Broad-based information sharing	Potential relevant persons self-identify in response to Esso's broad-based information sharing mechanisms, such as the Esso website, *Connection* magazine, advertisements etc.	No new potentially relevant persons identified that have not already been identified in the above.
Voluntary public consultation	Conducted voluntary EP consultation via NOPSEMA portal.	The following self-identified following the voluntary public consultation: • 1 eNGO • 6 worker representative bodies (Unions) • 1 industry body • 2 individuals

Method	Description	Findings
		• 1 commercial fishing representative body
First Nations people		
Seek advice of First Nations groups	Met with Koorie Heritage Trust to discuss cultural heritage, engagement protocols and sea country.	No new potentially relevant persons identified but advice received as to engagement protocols and challenges.
Sea Country	Research Sea Country for publications that may identify flora or fauna of cultural significance, relevant to the activities in this EP. Review the South-east Regional Marine Plan and Kooyang Sea Country Plan. GlaWAC is the Registered Aboriginal Party (RAP) for the Gunaikurnai, the Traditional Owners of the land where Esso's pipelines cross from offshore. GLaWAC is currently undertaking a sea-country consultation process.	3 new potentially relevant organisations (also First Nations organisations).
First Nations organisations	Identify relevant Prescribed Body Corporate, Registered Aboriginal Parties, Native Title holders and claimants.	4 new potentially relevant organisations.
Other organisations	Identify other organisations that have a link to or involvement with First Nations people.	No new potentially relevant persons identified.
Recommendations	Seek recommendations of other potentially relevant persons who may wish to be consulted during consultations with First Nations groups/people.	No new potentially relevant persons identified.
Advertisements	Advertised in the Koori Mail newspaper to encourage self-identification through contact details provided and/or attendance at community sessions.	No new potentially relevant persons identified.
Environmental non-government organisations		
Advertisements	Advertised in National, State and Regional newspapers.	No new potentially relevant organisations identified.

Method	Description	Findings
Broad-based information research	Searched online for potentially relevant persons using key words including: fish, fishing, marine environment, oceans. Investigated and monitored social media channels. Reviewed media articles identified in above searches and via usual media monitoring.	9 new potentially relevant organisations identified.
Direct email	Direct email to contacts identified in broad based information research.	No new potentially relevant organisations identified.
Local knowledge	In person consultation with local businesses operating in the eco-tourism space.	No new potentially relevant organisations identified.

6.10.3 Evaluation

The findings of the relevant person identification process yielded 147 potentially relevant persons. Each of these potentially relevant persons was evaluated using the relevant persons criteria developed for this EP (Table 6-4) and found that all 85 existing relevant persons and 42 newly identified persons (127 in total) would be considered relevant persons within the scope of this EP.

6.10.4 Categorisation

In accordance with the OPGGS (Environment) Regulations, Regulation 11A (1)(a-d), Esso has grouped these 122 relevant persons into four categories as outlined in the following sections.

6.10.4.1 Category A, B and C relevant persons

A complete list of Category A, B and C relevant persons for this EP is provided in Table 6-6.

Table 6-6 Category A, B and C relevant persons

Relevant Person	Relevance
Category A	
Australian Fisheries Management Authority	Responsible for management of Commonwealth commercial fisheries from 3-200nm. The OAs overlap with local fisheries.
Australian Hydrographic Office (AHO)	Responsible for publication of nautical charts and other information for safety of ships navigating in Australian waters (including Notices to Mariners).
Australian Marine Oil Spill Centre (AMOSC)	Organisation set up by the petroleum industry to enable a quick and effective response to oil spills around the Australian coastline.

Relevant Person	Relevance
Australian Maritime Safety Authority (AMSA)	Agency responsible for maritime safety, protection of the marine environment including marine pollution and maritime aviation search and rescue.
Centre of Decommissioning Australia	Independent initiative working with industry, government and the community to create a collaborative and sustainable approach to decommissioning Australia's aging oil and gas infrastructure.
Department of Industry, Science and Resources	Department responsible for consolidating the Government's efforts to drive economic growth, productivity and competitiveness by bringing together industry, energy, resources and science.
Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Responsible for the implementation of Australia's marine pest and biosecurity management requirements when bringing in vessels. Responsible for administering Sea Dumping Permits under the Sea Dumping Act. Responsible for oversight of the EPBC Act.
Director of National Parks	Government-owned corporation responsible for the management of a portfolio of terrestrial and marine protected areas.
National Offshore Petroleum Titles Administrator (NOPTA)	Advises on and administers the OPGGS Act, provides regulation and management of offshore petroleum resources in Commonwealth waters.
NOPSEMA	Australian Government offshore energy regulator responsible for the health and safety, well integrity and environmental management aspects of offshore oil and gas operations in Australian Commonwealth waters; and in coastal waters where regulatory powers and functions have been conferred by state governments.
Parks Australia	Responsible for managing Commonwealth reserves and conservation zones.
Category B	
DEECA	Victorian Government Department responsible for matters related to energy, environment, water, agriculture, forestry, resources, climate action and emergency management functions. Biosecurity: Administers legislation related to agriculture and biosecurity.
CarbonNet	Responsible for the CarbonNet Project, which is working towards establishing a commercial scale Carbon Capture and Storage network in Gippsland, Victoria.
Department of Transport and Planning (DTP)	In broad terms, relevant for oil spill response as a control agency in Victorian State waters. No spill scenario has been identified for the activities in this EP.
Environment Protection Authority Victoria	In broad terms, relevant for oil spill response as they have jurisdiction over environmental matters in Victoria, including environmental protection and may advise on pollution and waste management in a

Relevant Person	Relevance
	response scenario. No spill scenario has been identified for the activities in this EP.
Gippsland Ports	Waterway management responsible for navigation, port operations, regulation, security and compliance, boating safety, incident management, emergency response, maritime security, oil spill response and salvage and dredging and sand management. No spill scenario has been identified for the activities in this EP.
Parks Victoria	In broad terms, relevant for oil spill response. They manage significant stretches of land along the Gippsland coastline and some maritime infrastructure in the Gippsland area (e.g. some piers, jetties, berths). No spill scenario has been identified for the activities in this EP.
Transport Safety Victoria – Maritime Safety	In broad terms, relevant for oil spill response. A branch of Transport Safety Victoria, working closely with vessel operators and waterway and port managers to provide expert knowledge, education, support and direction. No spill scenario has been identified for the activities in this EP.
Victorian Fisheries Authority	An independent statutory authority established to effectively manage Victoria's fisheries resources. Bay and Inlet Fishery licence holders overlap with the OAs.
Worksafe Victoria	Victoria's workplace health and safety regulator.
Transport for New South Wales	In broad terms, relevant for oil spill response. The control agency for marine pollution incidents impacting New South Wales State waters. No spill scenario has been identified for the activities in this EP.
Environment Protection Authority (Tasmania)	In broad terms, relevant for oil spill response as the control agency for marine pollution in Tasmanian State waters. No spill scenario has been identified for the activities in this EP.
Tasmania Parks and Wildlife Service	In broad terms, relevant for oil spill response. The managing authority of Tasmania's nature reserve system. No spill scenario has been identified for the activities in this EP.
Category C	
DEECA	Victoria's Regulator of exploration, mining, quarrying, petroleum, recreational prospecting and other earth resources activities. Assesses and authorises earth resource projects and enforces laws to ensure those projects are conducted such that the community and environment are safeguarded.

6.10.4.2 Category D relevant persons

A complete list of Category D relevant persons for this EP is provided in Table 6-7.

Table 6-7 Category D relevant persons

Relevant person	Functions, Interests and Activities
3D Oil	Oil and gas company with licenses offshore from Gippsland.
Australian Council of Trade Unions (ACTU)	Largest peak body representing workers in Australia.
Australian Institute of Marine and Power Engineers	Australian professional association.
Australian Manufacturing Workers Union (AMWU)	Automotive, Food, Metals, Engineering, Printing and Kindred Industries Union, is an Australian trade union.
Australian Oceanographic Services	Commercial business providing access to underwater research vehicles, technology and equipment.
Australian Southern Bluefin Tuna Industry Association	Association representing the Australian Southern Bluefin Tuna Industry working to maintain a high level of quality and training.
Australian WildCatch Fishing	Operates five fishing vessels in Gippsland and supports a variety of other Vessels, with the design and construction of Fishing Gear, Crew placement, Quota, licence management and associated administration.
Australian Wildlife Conservancy	Australian independent, ’on-profit organisation, working to conserve threatened wildlife and ecosystems.
Australian Workers' Union (AWU)	One of Australia's largest and oldest trade unions.
Bass Oil	Oil and gas company with licenses offshore from Gippsland.
Bass Strait Bait & Tackle Lakes Entrance	Lakes Entrance based business servicing the recreational fishing industry.
Beach Energy	Oil and gas company with licenses offshore from Gippsland.
Boating Industry Association of Victoria	Not-for-profit organisation and the peak body representing the recreational and light commercial marine industry.
Bush Heritage	Bush Heritage Australia is a non-profit organisation with headquarters in Melbourne, Australia, that operates throughout Australia.
Bunurong Land Council Aboriginal Corporation	The Traditional Owners of the land where Esso operates it’s Hastings facilities.

Relevant person	Functions, Interests and Activities
Committee for Gippsland	Independent group established to represent all sectors of business, industry and community views to collaboration on regional priorities to benefit Gippsland communities.
Commonwealth Fisheries Association	Independent professional association contributing to the formulation of effective and responsible fisheries policies.
Community Over Mining	Non-government organisation covering many topics in Gippsland and around Australia including pollution to air, land and water.
Cooper Energy	Oil and gas company with licenses offshore from Gippsland.
Corner Inlet Fisheries Habitat Association Inc.	Commercial fishers association to facilitate and encourage better habitat protection and stewardship of the local marine resource.
Country Fire Authority (Region 10 – Sale)	Victoria’s volunteer fire service, operating across the state to reduce the occurrence and impacts of fire and other emergencies.
Danish Seine Vessel	Lakes Entrance fishing vessel.
East Gippsland Catchment Management Authority	Management of land, biodiversity and water resources in the region.
East Gippsland Estuarine Fisherman's Association Inc.	Fishing Association representing the interests of the Gippsland Lakes Estuarine fishers.
East Gippsland Shire Council	Local council/authority responsible for the provision of infrastructure services to residential and business rate payers.
Eastern Victorian Sea Urchin Divers Association	Industry body representing Sea Urchin Divers.
Eastern Zone Abalone Industry Association	A wild catch abalone industry sector that operates in the Mallacoota regions of Victoria.
Electrical Trades Union (ETU)	Australian trade union.
Emperor Energy	Energy company with assets in Australia including in the Gippsland Basin adjacent to Esso’s fields.
Extinction Rebellion Australia	eNGO focused on persuading governments to act on climate and ecological matters.
Far Out Charters	Local business operating offshore fishing charters based out of Lakes Entrance.
Fishing Tribunal	Independent group established to consider commercial fishing vessel damage claims

Relevant person	Functions, Interests and Activities
	resulting from interaction with Esso equipment/facilities.
Fishing Tribunal - Independent chair	Chairperson of the Fishing Tribunal.
Fisherman's Tribunal - Member	Independent member of the Fishing Tribunal.
Friends of the Earth	eNGO working to protect and/or educate about the natural environment.
Game Fishing Association of Victoria	The governing body for Game Fishing in Victoria.
Gippsland Lakes Fishing Club	Recreational fishing club based in Lakes Entrance.
Greenpeace	eNGO campaigning for a green and peaceful future.
Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC)	Registered Aboriginal Party that represents the Gunaikurnai people, the Traditional Owners of our Country, as determined by the Victorian Aboriginal Heritage Council under the *Aboriginal Heritage Act 2006*.
Hewardia	Lakes Entrance fishing vessel.
Koorie Heritage Trust	To promote, support and celebrate the continuing journey of the Aboriginal people of South Eastern Australia.
Lake Tyers Beach Angling Club	Recreational fishing club based in Lakes Tyers.
Lakes Entrance Fisherman's Club	Recreational fishing club based in Lakes Entrance.
Lakes Entrance Fishermen's Co-Operative	Fishing co-operative representing the interests of Lakes Entrance based commercial fishing vessels.
Lakes Entrance Scallop Fishing Industry Association	Commercial scallop fishing industry group.
Lakes Entrance Visitor Information Centre	Information centre at Lakes Entrance providing local information for visitors to the area.
Life Saving Victoria	Not-for-profit organisation working with communities, educational institutions, government agencies, businesses and the broader aquatic industry to prevent aquatic related death and injury in all Victorian communities.
Lonsdale Eco Cruises	Lakes Entrance tour company.

Relevant person	Functions, Interests and Activities
Marine and Safety Tasmania	Statutory authority established to ensure the safe operation of vessels, provide and manage marine facilities and manage environmental issues relating to vessels.
Maritime Industry Australia Limited	Organisation established to be the voice and advocate of the Australian maritime industry.
Maritime Union of Australia (MUA)	Union which covers waterside workers, seafarers, port workers, professional divers, and office workers associated with Australian ports.
Marley Point	Lakes Entrance fishing vessel.
Mitchelson Fisheries Pty Ltd	Commercial fishing company based in Lakes Entrance.
Mornington Peninsula Shire	Local council/authority responsible for the provision of infrastructure services to residential and business rate payers.
National Decommissioning Research Initiative	Independent science to better understand the impacts of decommissioning oil and gas structures on the Australian marine environment.
Oil Spill Response Limited	Industry-funded cooperative which exists to respond to oil spills.
Panama II octopus fishing vessel	Commercial octopus fishing vessel including captain and crew based in Lakes Entrance.
Piscari Industries Pty Ltd	Commercial fishing company based in Lakes Entrance.
Port of Hastings	Responsible for managing the operations at the Port of Hastings, including maintaining the associated port infrastructure.
Relevant Person #192	Gippsland community member.
Relevant Person #201	Gippsland community member.
Relevant Person #351	Gippsland community member.
Relevant Person #352	Gippsland community member.
Relevant Person #358	Gippsland community member.
Relevant Person #360	Gippsland community member.
Relevant Person #367	Gippsland community member.
Relevant Person #369	Gippsland community member.

Relevant person	Functions, Interests and Activities
Relevant Person #375	Gippsland community member.
Relevant Person #376	Gippsland community member.
Relevant Person #377	Gippsland community member.
Relevant Person #384	Gippsland community member.
Relevant Person #385	Gippsland community member.
Save Westernport	Advocates for protection of the coastal forest in the Western Port region.
Scallop Fisherman's Association Inc.	A collective of the Scallop Fishing Families and associated support work force based in Lakes Entrance.
Seafood Industry Victoria	A not-for-profit, non-government organisation. SIV is the representative peak body for the Victorian seafood industry, from professional fishers through to wholesale, processors and retail.
SETFIA	Incorporated association representing commercial fishers in Commonwealth South East Trawl Sector; Scalefish Hook Sector; Shark Hook, Shark Gillnet Sectors; small pelagic fishery.
SETFIA Chairman	Chairman of Incorporated association representing commercial fishers in Commonwealth South East Trawl Sector; Scalefish Hook Sector; Shark Hook, Shark Gillnet Sectors; small pelagic fishery.
Seven Group Holdings Limited (formerly Nexus)	Oil and gas company.
Silver Star (Atoll)	Commercial vessel operating out of Lakes Entrance capable of facilitating ROV and other oil and gas industry work.
South Gippsland Shire Council	Local council/authority responsible for the provision of infrastructure services to residential and business rate payers.
Southern Shark Industry Alliance	Incorporated association with members from the Southern and Eastern Scalefish Hook Sector; Shark Hook, Shark Gillnet Sectors; small pelagic fishery.
Star of the South	Commercial venture proposing an offshore wind farm project of the South Coast of Gippsland.

Relevant person	Functions, Interests and Activities
Sustainable Shark Fishing Association	Represents fishers in the Southern and Eastern Scalefish and Shark Fishery, Gillnet Hook and Trap fisheries.
Tasmanian Land Conservancy	Not-for-profit community-based organisation working to protect ecosystems.
Tasmanian Seafood Industry Council	Peak body representing the interests of wild capture fishers, marine farmers and seafood processors in Tasmania.
The Nature Conservancy	Environmental conservation charity whose mission is to conserve the lands and waters on which all life depends.
The Wilderness Society	eNGO working to protect, promote and restore wilderness and natural processes across Australia.
Trust for Nature	eNGO working to permanently protect habitat on private land to give native plants and animals safe places to live.
Victoria Game Fishing Club	Governing body for Game Fishing in Victoria.
Victorian Recreational Fishing	Organisation representing Victorian Recreational Fishing in Victoria.
Victorian Regional Channels Authority	Victorian State government agency/authority managing commercial navigation in the port waters of Geelong and Hastings.
Victorian Rock Lobster Association	Victorian Rock Lobster fishing industry representative group.
Victorian Scallop Fisherman's Association Inc.	Commercial scallop fishing representative body.
Victorian Trades Hall Council (VTHC)	Coordinate union activities and campaigns, involving more than one union.
Wellington Shire Council	Local council/authority responsible for the provision of infrastructure services to residential and business rate payers.
Western Australian Fishing Industry Council	Peak industry body representing professional fishing, pearling and aquaculture enterprises, processors and exporters in Western Australia.
Wildlife Victoria	Community organisation providing Wildlife Emergency Response.
World Wide Fund for Nature	eNGO that works in the field of wilderness preservation and the reduction of human impact on the environment.

Relevant person	Functions, Interests and Activities
Yachting Victoria	Organisation providing sailing advice for the South East of Australia.

6.10.5 Verification

For relevant persons consultations conducted prior to the revision in consultation methodology, verification was undertaken with Category D relevant persons through one-on-one consultation with relevant persons. These engagements included face-to-face meetings, phone calls and emails. The Relevant Person Questionnaire process had not been implemented at the time.

Where relevant persons advised changes to their functions, interests or activities during these consultations, the relevant persons database was updated accordingly.

No issues with true representation were raised.

Where relevant persons communicated to Esso a desire to ‘opt out’ of the consultation process, or to be consulted only through their group associations, these wishes were recorded in the relevant persons database, signifying the end of the consultation process for the relevant person.

6.11 Consultation process undertaken for this Environment Plan

To ensure the consultation process is appropriate for the category of relevant person, and the type of function, activities or interest; Esso has identified the most relevant typical engagement mechanisms for each category of relevant persons, as shown in Table 6-8.

Table 6-8 Typical engagement mechanisms of relevant persons by category

Category	Typical engagement mechanism
Category A, B & C	Regular briefings, periodic updates, adhoc meetings and reporting.
Category D	Face-to-face engagements, phone calls, community meetings, newsletters and information bulletins.

These typical engagement mechanisms were used to inform design of the consultation process.

Esso supplements these activity-specific consultations with generalised broad-based information sharing with all of Esso’s stakeholders.

6.11.1 Campaign #1 Steel Piled Jackets End State specific consultations

Campaign #1 Steel Piled Jackets End State consultations began in February 2020 using various methods of consultation. A summary of key in-person consultations and written communications undertaken is provided in Table 6-9.

Table 6-9 Key in-person consultations and written communications

Date	Consultation	Relevant person
September 2020	General email advice (underwater study activity)	All relevant persons
	General engagement (exclusion zones during underwater studies)	Commercial fishing groups
October 2020	Text messaging advice (Esso survey activity)	Potentially impacted relevant persons
December 2020	Meeting	Members of Fisherman's Tribunal
	Meeting	Independent chair of Lakes Entrance Fisherman Tribunal
	Meeting	SETFIA
January 2021	Email, phone calls	Key relevant persons
February 2021	Email, phone calls	Key relevant persons
March 2021	Email, phone (noise monitoring activities being undertaken)	Potentially impacted relevant persons
June 2021	Meeting	SETFIA
	Meeting	Relevant Person #192, Commercial fishing vessels
July 2021	Meetings, emails, phone calls	SETFIA re fishing studies
August 2021	Meeting	Fisherman's Tribunal discussion and presentation on Esso decommissioning
	Meetings, emails, phone calls	SETFIA re fishing studies
November 2021	Emails, meetings	DCCEEW
December 2021	Meetings	Various Lakes Entrance businesses, SETFIA, Fisherman's Tribunal members, Scallop Fishermen's Association
	Meeting	Department of Transport (Vic)
	Meeting	DCCEEW
February 2022	Presentation	AMSA
	Meeting	Various relevant persons located in Gippsland, Victorian fishing bodies
	Meeting	SETFIA Annual General Meeting of members

Date	Consultation	Relevant person
	Meeting	Fisherman's Tribunal
	Meeting	DEECA
	Meeting (and Annual report distribution to members)	Game Fishing Club of Victoria
	Meeting	Victorian government departments and agencies, including Department of Transport, Parks Victoria
	Media release re MPSV	All media, key relevant persons
	Meetings	AMSA, AMOSC
	Annual Report distribution	Targeted to specific State Government bodies including Transport for NSW
March 2022	Meeting & Presentation	DEECA
	Attended combined committee meeting (Port of Hastings)	Department of Transport
	Meeting	Lakes Entrance Visitor Information Centre seeking specific guidance re First Nations groups in the area
	Meeting	Various commercial fishing industry participants including SETFIA, LEFCOL
	Meetings	DCCEEW
	Meetings, emails	Seafood Industry Victoria
April 2022	Meetings, emails	AMSA
	Meetings, emails	SETFIA
	Emails, phone calls	Game Fishing Association of Victoria
	Email, meeting	DEECA
May 2022	Meetings, emails	AMSA
	Meetings, emails, phone calls	SETFIA
	Meetings	DEECA
	Emails, phone calls	Game Fishing Association of Victoria
	Emails, meetings	DCCEEW
June 2022	Meeting	AMSA

Date	Consultation	Relevant person
	Meetings, emails	Various commercial fishing industry participants including SETFIA, Scallop fishing association
	Meeting	Various recreational fishing participants
	Meeting	Fishing tribunal members
July 2022	Emails	AFMA, Director of National Parks, Parks Australia
August 2022	Public consultation via NOPSEMA website	Any interested parties
	Emails	The Wilderness Society
	Emails	All relevant persons – advising public consultation available via NOPSEMA website
	Emails, meetings	DCCEEW
September 2022	Meetings	Various commercial fishing industry participants including SETFIA, LEFCOL
December 2022	Meetings	DEECA
	Email, Letter	Public consultation responses including organisations and individual relevant persons.
January 2023	Meetings	AMSA
February 2023	Email, meetings	AMSA
March 2023	Meeting	DEECA Bairnsdale office
April – May 2023	Emails, Meetings	2022 Decommissioning Report

Information bulletins #1 and #2 specific to the options assessment process undertaken for the SPJs (and monotowers) were provided to relevant persons in March/April and June 2022 respectively and are shown in Appendix C2.

These information bulletins were designed to provide ‘sufficient information’ including an overview of the proposed activity including information on the activity description, scope, timing, location, risks and impacts, values and sensitivities and mitigation measures.

Esso also conducted several community sessions in the local area as outlined in Table 6-10. To ensure every effort was made to reach as many potentially relevant persons as possible, two approaches were taken to community sessions. This includes sessions:

- targeted to a specific group of relevant persons, advertised through their group communication channels
- advertised broadly in various news outlets, as shown in Table 6-11, to all relevant persons and open to the public.

Table 6-10 Community sessions summary

Date	Description
27 February 2020	SEAMAC Lakes Entrance for Eastern Fishing Fleet
9 March 2022	Lake Tyers Angling Club monthly committee meeting
4 May 2022	Lakes Entrance Fishing Club monthly committee meeting
24 May 2022	Esso Annual Community Dinner
17 August 2022	Longford drop-in session
18 August 2022	Lakes Entrance drop-in session
16 August 2022	Hastings drop-in session
5 October 2022	Lakes Entrance Fishing Club monthly committee meeting
15 February 2023	Sale drop-in session
16 February 2023	Lakes Entrance drop-in session

Table 6-11 Community session advertisement

News outlet	Advertisement feature date	News outlet	Advertisement feature date
The Australian	17-Feb-23	Eden Magnet	08-Feb-23
Herald Sun	17-Feb-23	The Examiner	08-Feb-23
Hobart Mercury	17-Fe—23	The Advocate	08-Feb-23
The Daily Telegraph	17-Feb-23	Koori Mail	22-Feb-23
Lakes Post	08-Feb-23	Tamar Valley News	Between 1 - 8 Mar
Bairnsdale Advertiser	08-Feb-23	Gippsland Times	07-Feb-23
Snowy River Mail	08-Feb-23	South Gippsland Sentinel Times	07-Feb-23
Batemans Bay Post	08-Feb-23	La Trobe Valley Express	08-Feb-23
Eurobodalla Shire Independent	08-Feb-23	Western Port News	08-Feb-23

Esso’s consultation and engagement with relevant persons who identify as First Nations people and/or organisations, is outlined in Table 6-12.

Table 6-12 Consultation with First Nations people/organisations identified as relevant persons

Relevant person	Method of engagement	Outcome
GLaWAC	Email to general mailbox	No response (3).
	Email to Contact 1	Meeting requested (3)
	Email to Contact 2	No response (3).
	Email to Contact 3	No response (2).
	Email response received from Contact 1	No objections, claims or issues raised. Unable to meet (2)
	Completion of contact request form on website https://gunaikurnai.org/our-country/sea-country/	Automated response only.
	In-person visit at: 27 Scriveners Rd, Kalimna West, Victoria 3909	Left contact details.
	Phone call to main phone line (receptionist)	Left contact details (2).
	Phone call to Contact 1	Call returned (1). Message left (2).
	Phone call to Contact 2	Message left.
	Phone call with Contact 3	No objections, claims or issues raised (1). Message left (1)
Koorie Heritage Trust	Email to Contact 1	No objections, claims or issues raised (2).
	Email response received from Contact 1	Meeting scheduled (1). Meeting rescheduled (1)
	Meeting with Contact 1	No objections, claims or issues raised.
Bunurong Land Council Aboriginal Corporation	Phone call to main phone line (receptionist)	Left contact details.
	Email to general mailbox	No response.

Esso's consultation with eNGOs, worker unions and offshore wind developers during the preparation of this EP are outlined in Table 6-13, Table 6-14 and Table 6-15.

Table 6-13 Consultation with eNGOs identified as relevant persons

Relevant person	Method of engagement	Outcome
GreenPeace	Email to general mailbox	No response.
Bush Heritage	Email to general mailbox	No response.
Trust For Nature	Email to general mailbox	No response.
Tasmanian Land Conservancy	Email to general mailbox	No response.
World Wide Fund for Nature	Email to general mailbox	No response.
Extinction Rebellion Australia	Email to general mailbox	No response.
The Wilderness Society	Email to general mailbox	No response.
	Email from Contact 1	Requested documents from various EAPL studies.
	Email to Contact 1	No response (1). Letter submission (1).
	Letter posted to GPO address	No response.
Australian Wildlife Conservancy	Email to general mailbox	No response.
The Nature Conservancy	Email to general mailbox	No response.
Friends of the Earth	Email from Contact 1	Request for more information (1) Meeting follow up (1)
	Email to Contact 1	Meeting follow up (1)
	In person meeting	Further information provided - agreement to continue discussions.

Table 6-14 Consultation with worker unions identified as relevant persons

Relevant person	Method of engagement	Outcome
Australian Manufacturing Workers Union (AMWU)	Combined meeting with AMWU, AWU, ETU to discuss overall business and Decommissioning plans.	No objections, claims or issues raised.
	Email to follow up meeting and provide links to website information.	No response.

Relevant person	Method of engagement	Outcome
Australian Workers Union (AWU) Electrical Trades Union (ETU)	Combined meeting with AMWU, AWU, ETU specifically focused on decommissioning plans and SPJ end states.	Interest in onshore reception facility, pipelines and how much work is available overall. Agreed to meet quarterly.
	Email to follow up meeting and advise that feedback has been included in the EP.	No response.
Australian Council of Trade Unions (ACTU) Maritime Union of Australia (MUA) Victorian Trades Hall Council (VTHC) AMWU/AWU/ETU	Email to respond to feedback received during public consultation process.	No response.
	Letter to respond to feedback received during public consultation process.	No response.

Table 6-15 Consultation with offshore wind developers identified as relevant persons

Relevant person	Method of engagement	Outcome
Bluefloat	Meetings, emails	Exploratory discussions on asset repurposing.
Orsted	Meetings, emails	Exploratory discussions on asset repurposing.
Star of the South	Meetings, emails	Exploratory discussions and participated in a local capability workforce study.
Flotation	Meetings, emails	Exploratory discussions and reached agreement on asset re-purpose studies. Also participated in a Flotation lead risk assessment.
Direct Infrastructure	Meeting	Introductory discussion including a project overview.
Equis	Meeting	Introductory discussion including a project overview.
Shell	Meeting	Introductory discussion including a project overview.
RES	Meeting	Introductory discussion including a project overview.

Where feedback is received from relevant persons, Esso will consider the individual requests and create a plan for any additional consultation required in response to the feedback. All communications are recorded in the relevant persons database and presented in the Consultation report (refer to Section 6.13).

6.11.2 Voluntary public consultation

On 1 August 2022, Esso voluntarily submitted this EP for public comment. NOPSEMA facilitated the 30-day public comment process.

To support this process, Esso held community information sessions at Lakes Entrance on 16 August 2022 and at Longford on 17 August 2022. Session details were advertised in the Lakes Post on 3 and 10 August 2022 and Gippsland Times on 2 and 9 August 2022.

For a summary of feedback received during this process, refer to Section 6.12.

6.11.3 Broad-based information sharing

As part of Esso's commitment to engaging with relevant persons to build lasting long-term relationships, a range of broad-based information sharing mechanisms are used outside of the EP consultation process. These information sharing mechanisms include public sources that are available anytime and periodic releases to specific distribution lists, which are open to the public but require registration.

Esso's broad-based information sharing mechanisms are outlined in Table 6-16.

Table 6-16 Broad-based information sharing mechanisms

Mechanism	Description	How is this relevant to this EP?
Periodic updates	Esso uses email distribution to provide updates about Esso's offshore operations and activities, reports or information bulletins to stakeholders as appropriate.	Broad-based information sharing that provides existing relevant persons, potential relevant persons and other stakeholders the opportunity to learn more about the business plans and to seek specific information relevant to this EP activity.
Connection magazine	Esso's monthly newsletter, which is distributed via email and accessible on the Company website. The magazine provides stakeholders with regular updates on Esso's activities.	The following Connection magazine issues were provided via direct email to 107 stakeholders representing 73 organisations, with information related to decommissioning planning in general and proposed end states for SPJs: • December 2020 • April 2021 • May 2021 • June 2021 • August 2021 • December 2021 • March 2022 • June 2022

Mechanism	Description	How is this relevant to this EP?
Esso website	Esso's website is an online portal that gives broader groups of stakeholders up-to-date information on various facets of our business and provides an opportunity for relevant persons to make enquiries about our offshore activities and projects. The website is updated periodically to reflect new information and activity progress.	Introduced a specific decommissioning section that contains information related to ExxonMobil's global decommissioning experience, planning for Bass Strait decommissioning activities and early decommissioning works underway. The website is updated regularly to reflect work progress.
Annual Decommissioning Report	Accessible from Esso's website, this Report provides technical, yet accessible, insight into Esso's decommissioning plans and yearly progress. The Report is emailed directly to all Relevant Persons and shared more broadly with other interested stakeholders.	Two reports issued covering all aspects of decommissioning, including the end state options proposed in this EP. Reports were directly emailed to all relevant persons in: • January 2022 for the 2021 Report • April 2023 for the 2022 Report.

6.12 Relevant persons feedback

Esso is committed to considering all input and/or feedback received from relevant persons in the development of EPs.

Esso makes ongoing efforts to obtain feedback from relevant persons. All relevant persons, or any other stakeholder, have the opportunity to contact Esso's consultation and engagement team by emailing consultation@exxonmobil.com or calling Esso's Head Office on +61 3 9261 0000 or writing to GPO Box 400 Melbourne VIC 3001.

Esso clearly identifies and addresses each specific objection or claim raised by relevant persons, and if applicable:

- demonstrates that the risk or impact in question has been reduced to ALARP and will be of an acceptable level
- provides a statement that addresses each element of the objection or claim made by a relevant person and where control measures are implemented to resolve objections and claims, will clearly communicate this to the relevant person
- provides copies of all written responses provided by a relevant person to NOPSEMA.

In the event that Esso and a relevant person are unable to reach agreement, there is a broad objection (e.g. to resource exploitation) or differing views, such as on the significance of an environmental impact or risk, the consultation report will demonstrate that:

- reasonable attempts have been made
- reasonably available options have been explored for resolving or mitigating the degree to which a person may be affected, particularly through control measures

- the relevant person has been informed about how their objections or claims have been addressed.

Based on feedback the primary relevant person issues of concern regarding the proposed end states for the SPJs are:

- interaction with other marine users and commercial fishers
- potential involvement in work programs associated with decommissioning execution work program
- Petroleum Safety Zones (PSZs)
- alternate uses of the facilities.

Esso has considered all feedback and assessed the merits of claims about the potential impacts and risks relating to the proposed end states for the SPJs. A summary of feedback by relevant persons received during consultation for proposed SPJ end states, and Esso's response, is shown in Table 6-17. A summary of public consultation feedback and Esso's response, is shown in Table 6-18. A summary report on all EP-specific consultations undertaken up to the date of issue of this EP (excluding consultations with NOPSEMA itself) is included as Appendix C, and a detailed report, also referred to as the 'sensitive information part', pertaining to EP-specific consultations undertaken up to the date of issue of this EP is provided to NOPSEMA as a Sensitive Information Appendix.

Table 6-17 Relevant person feedback summary and Esso responses

Item	Relevant person	Feedback received	Response/outcome from assessment of the merits of claims	EP Reference
1	AMSA	The 55m clear water column would be adequate from a safety of navigation perspective, consistent with IMO Standard 3.6 (International Maritime Organisation, 2000). AMSA would do the standard controls in this circumstance such as having the structures marked on charts. While the safety of navigation issues for the -55m option are manageable, we do strongly favour the benefits of full removal of existing infrastructure.	On consideration of this feedback, the option to remove SPJs to ensure a minimum 26m clearance below MSL was deemed 'not acceptable'. Feedback has informed control measures (CM2 and CM12).	Section 3.5. Section 10
2	AMSA	With the recent Offshore Electricity Act and existing petroleum exclusion zones significant activity is expected offshore. AMSA sees advantages to full removal for those other users, and also in the way it would return the	Explained that even under the complete removal option, due to the existence of the jacket structure and all of the production wells remaining below seabed, the ability to install other installations on top of the previous	Section 8.2.1

Item	Relevant person	Feedback received	Response/outcome from assessment of the merits of claims	EP Reference
		environment back to what it was before the installation.	jacket locations is not possible.	
3	Commonwealth Fisheries Association	Commonwealth fishers are impacted by infrastructure in Commonwealth waters - particularly the trawl and other demersal fishing operations. Encouraged Esso to continue engaging with commercial fisherman.	Esso continues to engage with commercial fisherman to understand and address concerns.	Section 8.3 Section 9.3
4	Commercial fishing	Commercial fishermen have an expectation that if structures are left in the water that the 500m PSZ will be reduced or removed.	NOPSEMA clarified that if there is no operational property subject to IMR, the PSZ should be removed. This feedback has informed the impact assessment in Section 8.3 and control measure CM3 in Table 10-1.	Section 8.3 Table 10-1.
5	Recreational fishing	Will decommissioning require special road equipment and movements?	Will continue engaging as decommissioning progresses.	N/A
6	Recreational fishing	Concerns that Esso offshore infrastructure is falling down/is unsafe.	Explained that offshore structural integrity programs continue to be conducted to ensure the safety and integrity of platforms.	N/A
7	Local business	Requested updated maps of Esso offshore facilities to share with the public.	Provided updated maps.	N/A
8	Commercial fishing	Anything left on the seabed that isn't over trawlable requires fishermen to re-map activities which causes frustration.	This feedback has informed the impact assessment in Section 8.3, the risk assessment in Section 9.3 and control measures CM2, CM4, CM12 and CM13 in Table 10-1.	Section 8.3 Section 9.3 Table 10-1.
9	Fisherman's Tribunal	If SPJs are left in place what's the timing on degradation?	Studies have been completed and relevant person informed degradation of platforms approximately 1000 years.	Section 8.5

Item	Relevant person	Feedback received	Response/outcome from assessment of the merits of claims	EP Reference
10	Commercial fishing	How will commercial fisheries be compensated once Esso completes decommissioning?	Esso are reviewing similar compensation schemes used around the world and will continue to discuss with relevant person. This feedback has informed Section 11.11.2 and control measures CM5 and CM6 in Table 10-1.	Section 11.11.2 Table 10-1.
11	Commercial fishing	Commercial fishermen key concern is whether or not anything left on the seabed is over trawlable in order to allow them to increase their fishing opportunities.	Advised that the remaining infrastructure would not be over trawlable.	Section 8.3 Section 9.3
12	Commercial fishing (vessel operator)	The less disturbance to the environment the better (eg dredging). If structures are left they need to be visible.	Feedback has informed risk assessment in Section 9.3.	Section 9.3
13	Local community	Will there be opportunity to employ local community/businesses associated with decommissioning works?	Will continue engaging as decommissioning progresses.	N/A
14	General	How long will the decommissioning program take?	Provided annual decommissioning reports describing asset lifecycle.	N/A
15	General	What does the decommissioning program look like?	Provided annual decommissioning reports describing asset lifecycle.	N/A
16	General	What are the stages of decommissioning? When does it start?	Provided annual decommissioning reports describing asset lifecycle.	N/A
17	General	How long after a platform stops producing before we see it removed?	Provided annual decommissioning reports describing asset lifecycle.	N/A
18	General	What happens to the materials from the platforms? Will they be recycled? Where does it all get sent to?	Advised all relevant persons this is still under review and will advise when contract is finalised.	N/A
19	Fishing	What vessels will be used for decommissioning?	Described the types of vessels that could be involved in the activities	N/A

Item	Relevant person	Feedback received	Response/outcome from assessment of the merits of claims	EP Reference
			such as Multi-Purpose Support Vessel (MPSV), HLV and other support vessels.	
20	General	Are Esso considering alternative uses for the platforms and other equipment e.g. carbon capture and storage windfarms?	Shared with relevant persons that Esso is reviewing various alternate uses for the SPJs including carbon capture and storage.	Section 3.2.3
21	General	When does Esso return the licences to the Government?	Provided annual decommissioning reports describing asset lifecycle.	N/A
22	General	What environmental studies are Esso doing/have done?	Advised that Esso were conducting a variety of studies, including ROV surveys and environmental sampling among others.	Section 3.3.1
23	General	Will Esso continue to support local community programs?	Yes	N/A
24	Environmental	What is Esso's criteria for determining the best environmental outcome?	Provided annual decommissioning reports and information bulletins outlining the Decommissioning Options Assessment and EOBO Assessment.	Section 3.4
25	General	When does Bass Strait shut down? When does Esso stop producing oil and gas?	Provided annual decommissioning reports describing asset lifecycle.	N/A
26	General	Will all the platforms be removed?	Provided annual decommissioning reports and information bulletins outlining proposed end state options and EOBO Assessment.	Section 3
27	General	Do you intend to leave anything as an artificial reef?	Provided information bulletins outlining EOBO and proposed end state options.	Section 3
28	Fishing	SETFIA advised that whilst gathering data for the fishing studies, some of the industry had advised that "there was suspicion about Esso wanting	Engaged with SETFIA that this is not what Esso are requesting from regulators. Esso is committed to taking the topsides to	Section 3.2.2

Item	Relevant person	Feedback received	Response/outcome from assessment of the merits of claims	EP Reference
		to establish dump zones" (where they don't fish) for unused equipment.	shore for dismantling and disposal.	
29	Recreational fishing	Recreational fishers have the opinion that complete removal would be detrimental to the existing marine ecosystem which has evolved over the past 50 years. Preferred option would be structures left (as much as possible) at a safe level below water line. This would sustain existing marine life and create artificial reefs for recreational fishing activity's which would provide anglers with the opportunity to target various pelagic species, also providing economic benefits to towns such as Lakes Entrance; the addition of lights would be an advantage as well.	This feedback has informed the Decommissioning Options Assessment in Section 3. Provided feedback to relevant person that as the end state is not yet known, cannot comment on the addition of lights at this time.	Section 3
30	Fishing	Fishing operators asked if there were any opportunities for fishing liaison officer roles and/or the use of their vessels.	Will continue engaging as decommissioning progresses.	N/A
31	Fishing	Vessel operators asked if there were any opportunities for the use of their vessel(s) (dive boats, transport etc.)	Will continue engaging as decommissioning progresses.	N/A
32	Fishing	Fishing industry asking where the liability will sit once we have removed SPJs?	Advised that the current Fisherman's Tribunal remains in place while Esso continues to operate in Bass Strait. Arrangements for post this time will be reviewed. This feedback has informed Section 11.11 of the EP.	Section 11.11
33	Director of National Parks	EP should identify and manages all impacts and risks on Australian marine park values (including ecosystem values) to an acceptable level and has	This feedback has informed the EP. The OAs do not occur within any Australian marine parks. The closest are the East Gippsland Marine Park,	Section 5.4.4.

Item	Relevant person	Feedback received	Response/outcome from assessment of the merits of claims	EP Reference
		considered all options to avoid or reduce them to as low as reasonably practicable.	over 120 kilometres to the east and the Beagle Marine Park, over 90 kilometres to the southwest of the nearest OA	
34	eNGO	Would not support removal of the SPJs below the mudline, given the significant disturbance to the seafloor.	Feedback noted	Section 3.2.5.1
35	eNGO	Queries around the treatment of the removed topsides, recycling and treatment facilities.	Provided explanation of current planning in this area.	Section 8.6.

Table 6-18 Feedback and Esso responses from public consultation process

Item	Theme	Summary of feedback/claim	Response/outcome
1	Re-use of structures	Structures could be retained and re-used for alternate activities e.g. environmental, marine or other research hubs, defence or weather outposts, training sites and tourism, wind farms. The rich marine environment around each facility could also be preserved.	This comment is consistent with this EP. Refer to Section 3.2.2.
2	Retention of ecosystems	Every effort should be made to retain the basis on which these eco-systems have structured their lives.	This comment is consistent with this EP. Refer to Section 3.4.
3		The EP fails to acknowledge and support with further science, the benefits to aquatic species at a population level. Using this for justification needs to be substantiated.	This EP references work done to demonstrate the benefits of retaining the lower sections of SPJs as a novel ecosystem. Refer to Section 8.4.2 to Section 8.4.6. The connectivity and productivity studies that Esso has commenced will help to address the question raised. Findings of these studies will be evaluated and assessed for impacts to the EP and discussed with NOPSEMA as appropriate. Esso has considered this comment in relation to this EP and made no changes at this time. Changes to this

Item	Theme	Summary of feedback/claim	Response/outcome
			EP may be made based on the findings from the connectivity and productivity studies (see control measures CM8 and CM9 in Table 10-1.)
4	Removal of the foundations will result in significant impact from dredging	During the installation of the infrastructure, dredging was an acceptable activity, and the environmental impacts were mitigated through a range of controls to demonstrate ALARP.	Dredging was not undertaken during the installation of Bass Strait SPJs. Esso has considered this comment in relation to this EP and made no changes.
5	Cumulative impacts	In assessing and describing the cumulative impacts associated with the proposed decommissioning, the EP does not adequately address those issues.	As a result of this feedback, this EP has been revised to specifically discuss cumulative impacts. See Table 3-8.
6	Significant long term lasting consequences to the fishing industry and their right to fish	The ecological, social and economic value of the commercial fishing industry needs to be described, assessed and considered in this EP.	Section 5.6.1 of the EP describes fishing effort and value. Section 8.3 and Section 9.3 of this EP describes potential impacts to commercial fishing operations as a result of the proposed end states. Esso has considered this comment and continues to engage with the Commercial fishing industry to develop the appropriate mechanism to address any impacts to their industry.
7	Contamination from infrastructure remaining in place	If leaving materials in place create a perception to the world that our oceans are polluted, overnight the fishing industry could have its export markets stopped and/or mandatory laboratory testing of seafood products implemented prior to export.	This EP describes how contaminants such as skimmer piles, chemical and fuel tanks and components with epoxy or model coatings will be removed to ensure that the SPJ sections proposed to be left in place are free of any contaminants. See Section 4.4. Section 8.5 describes the degradation of the remaining uncoated steel, anode and grout material.
8		Titleholder should independently verify that remaining infrastructure is clean and free of any contaminants	
9	Compensation	Compensation must be paid to the fishing industry for the permanent loss of grounds aligned with the concept	This EP discusses compensation arrangements for the fishing industry in Section 11.11.2.

Item	Theme	Summary of feedback/claim	Response/outcome
		model developed by the Scottish Fishermen's Federation	Esso has considered this comment and added additional information to Section 11.11.2. Esso continues to engage with the commercial fishing industry to develop the appropriate mechanism to address any impacts to their industry.
10	Regulatory compliance	Esso must comply with s.572 (2) and (3) of the OPGGS Act. Esso has not made an adequate case for a deviation from these removal requirements.	This EP: • identifies removal options that are feasible; and • provides an assessment that concludes that leaving some sections of SPJs in the marine environment will result in an equal or better environmental outcome than full removal. See Section 3.2. This EP has been submitted to NOPSEMA for assessment against the regulatory requirements.
11		No deviation from removal requirements should be allowed	
12		Deviating from the base case of full removal must only occur if it is impossible to safely remove the oil and gas infrastructure. We are not satisfied that Esso have made this case. Instead they seem to argue that there are environmental benefits to leaving infrastructure in place.	
13	Electrical safety	The EP does not address electrical safety of workers, platforms, and vessels and also fails to make provision for the disposal of any electrical apparatus (or parts thereof) and materials that will result from the decommissioning process.	Safety matters are outside the scope of the EP. They will be addressed in safety cases for the facilities involved with decommissioning. Onshore activities associated with demolition, recycling and disposal have been discussed as 'indirect impacts and risks outside of the title area' in Section 8.6.
14	Execution aspects	Provide an improved Option D that cuts the steel jackets flush with the seabed. There is no need for 5 metres of the jacket to be left in place. EP does not sufficiently justify that cutting flush with the seafloor requires dredging.	As a result of this feedback, additional technical information on the observed presence of obstructions within some skirt piles and subsequent need for external cutting (including potential dredging) has been added to Section 3.2.5.2.
15		5m stubs should not be left behind at the Bream A and Whiting platforms, located in shallower water.	

Item	Theme	Summary of feedback/claim	Response/outcome
16	Onshore Reception Centre	All dismantled materials should be transferred onshore for proper disposal and recycling in Australia.	The option to place selected sections of SPJ on the seabed has been included in this EP (as well as the option for all removed material to be transferred onshore for disposal) as it has been assessed that this provides an equal or better environmental outcome than complete removal. See Section 3.8.
17	Wind farm developments	NOPSEMA should require that the deadline for removal of this disused offshore oil and gas infrastructure be brought forward so that it is complete by 2025. This is essential to allowing necessary new offshore renewable energy infrastructure to be constructed in this area.	This EP includes the impacts on other potential industries from SPJ sections being left in place. See Section 3.3.2. Plans for offshore wind facilities are already in the public domain while oil and gas facilities are still in place. This demonstrates that it is not essential for oil and gas facilities to be removed for wind facilities to be installed.
18		Almost the whole area covered by this EP is likely to become a part of the new Gippsland Offshore Electricity Area, set to be declared later in 2022. There is an urgent need to clear disused and deteriorating infrastructure so the area can be used to build offshore wind farms to generate electricity urgently needed when coalfired power stations shut down.	
19	Financial aspects	It is concerning that after making billions in profit from its Bass Strait facilities since 1969, including $71 billion in the past 7 years alone, that Esso has left facilities disused and poorly maintained since 2008.	This statement is not relevant to this EP, which considers environmental criteria required by the OPGGS (Environment) Regulations and NOPSEMA policies relating to decommissioning of facilities. Esso continues to maintain facilities consistent with obligations under Section 572 of the OPPGS Act.
20	Long term impacts	Esso are seeking permission to leave infrastructure in place for up to 1,400 years while it deteriorates. It is impossible for us to predict the risks that could develop and how the	Section 572 of the OPGGS Act provides for deviation from removal to be considered. This EP describes Esso's assessment of impacts and risks of

Item	Theme	Summary of feedback/claim	Response/outcome
		use of this sea area will change in this time.	material degradation over the long term. See Section 8.5.
21		The proponent needs to consider how environmental risks may evolve over the 1400-year period the infrastructure is likely to persist, and how the likelihood of a low-chance but high-impact event stemming from the infrastructure presence should also be taken into account.	.
22	Title surrender	Surrendering titles and licences removes Esso's responsibility for any future problems. It is essential that all infrastructure is properly and thoroughly removed and secured before titles and licences are surrendered.	Title surrender is not within the scope of this EP. In addition, the OPGGS Act now provides for remedial directions to be issued to former titleholders, after title surrender. See Section 11.11.1.
23	Decommissioning benefits	There is no benefit for the workforce or community of leaving this infrastructure to deteriorate in place.	This EP assesses environmental impacts and risks as is required by the OPGGS (Environmental) Regulations and policies relating to decommissioning and guidance on demonstrating an "equal or better environmental outcome". See Section 3.7. Labour costs are not a relevant consideration in accordance with the Environmental Regulations Esso has formed the view that there is benefit to the environment in decommissioning some infrastructure in place.
24		Concerned that Esso's preferred option E, leaving 8 of the jackets in place at 55m below the sea's surface, has been chosen to save labour costs for saturation divers, not to mention the further cost of transport and proper disposal of these structures.	
25	Environmental risk	The infrastructure covered in this EP is located in a 'biogeographic break'. On one side of this break specific ecosystems and species are found that are distinct from those on the other side of the break. Concerned that if left in place over approximately the next 1,400 years, the structures	The likelihood of Bass Strait platforms acting as stepping stones for climate range-extending invasive native species would depend on many factors, including: • climate change and further shifts in the strength of the East Australia Current to enable more tropical species to extend their range south;

Item	Theme	Summary of feedback/claim	Response/outcome
		could act as stepping stones across the biogeographic break and lead to the invasion of species into ecosystems other side of the boundary where they have never been present before.	• the ability of range shift species to settle on or recruit to platform structures (which links to biology, competition with those already there); and • the ability of range shift species to subsequently reproduce and live on these structures. Esso has considered this comment in relation to this EP and added an additional assessment (refer to Section 9.5).
26	Reports and studies referenced	Esso has not made public the reports about the supposed environmental benefits of leaving equipment in place.	Esso has prepared and submitted this EP (including references to other documents) to NOPSEMA for assessment. The relevant reports have been summarized in this EP. The assessment process is that, where NOPSEMA requires further information, Esso either • summarises findings from a referenced document in the EP; or • provides NOPSEMA with the reference document. Esso anticipates that NOPSEMA will continue to follow this process.
27	Environmental and safety standards during decommissioning execution	The highest environmental and safety standards (particularly including electrical safety) should be applied to the processes for disposal and recycling of the dismantled materials.	Description of the detailed execution of processes for disposal and recycling of dismantled materials is outside the scope of this EP. These processes will be addressed in subsequent execution EPs. Safety matters are outside the scope of the EP. They will be addressed in safety cases for the facilities involved with decommissioning.
28		Once the end state is determined, close consideration should be given to the safest ways of carrying out the decommissioning and removal work.	
29	Regulatory approvals processes	We are concerned that Esso is pre-empting the NOPSEMA approval process and the public consultation by already having ‘detailed discussions with DCCEEW’ and progressing permit applications under the Sea	Esso is not pre-empting the NOPSEMA approval process. The OPGGS Act and the Environment Protection (Sea Dumping) Act are separate Acts administered by separate government entities. To proceed with the decommissioning scope proposed, Esso requires

Item	Theme	Summary of feedback/claim	Response/outcome
		Dumping Act to leave infrastructure in place.	approvals from both NOPSEMA and the DCCEEW. Both permits are independent and can be applied for at the same time.
30	Environment Plan Summary document	We are concerned that the Esso document which NOPSEMA describes on its consultation page as a 'summary' of the Environment Plan is misleading and is not an accurate reflection of the EP and the options Esso is required to consider.	Esso acknowledges this comment and notes that the summary document is an opportunity to review and provide feedback without having to review the full EP (over 500+ pages).
31	Possible re-use of facilities	Concerned that potentially reusing parts of the Bass Strait oil and gas infrastructure for offshore wind projects could be used by oil and gas companies to avoid their obligation to properly decommission and remove this infrastructure as per the OPGGS Act. New offshore wind projects must use fit-for-purpose, specifically designed and adequately engineered purpose-built infrastructure.	Re-use of infrastructure and discussion of new offshore wind projects is outside the scope of this EP.
32	Relevant person	Two entities consider that they should be identified as a relevant person in relation to the consultation requirements of the OPGGS Act and Regulations.	This EP documents Esso's process to identify a 'relevant person' in accordance with the OPGGS (Environment) Regulations. See Section 6.7.2. Esso has considered this comment and included additional details on the methodology and selection criteria used to determine relevant persons for this EP. See Section 6.7.2. The two entities have been added as relevant persons in relation to the EP.
33	Decommissioning planning	Concern about splitting the decommissioning process into multiple EPs/early plan focuses on inaction as 'action'. We are concerned that this EP is being brought forward in this manner to mask the intent of the wider decommissioning campaign strategy for this grouping of infrastructure and minimise	Esso is required by Section 572 of the OPPGS Act to remove property that is no longer in use. Because of the highly interconnected nature of the Bass Strait production system and, in consultation with NOPSEMA, Esso's focus has been on planning for the decommissioning of 10 steel piled jackets, two monotowers and concrete gravity structure topside facilities that are no

Item	Theme	Summary of feedback/claim	Response/outcome
		the likelihood of the collective works being assessed as having a significant impact on the environment.	longer in use by the timing set by General Direction 817.
34	Characterisation of the Commonwealth role in Marine waters	The proponent has mischaracterised their EPBC Act obligations in relation to avoiding a significant impact to Commonwealth Marine waters. This mischaractisation leads to a lower-than-required level of detail about the local environment and about the likely risks to these environmental features.	Esso has held discussions with both DCCEEW and NOPSEMA on approval processes under the EPBC Act matters and disagrees with the assertion that Esso has mischaracterised its EPBC obligations. Section 2.1.2 discusses the EPBC Act and how it relates to the activities in this EP.

Esso considers that consultation with relevant persons has been adequate to inform the development of this EP. Notwithstanding this, Esso recognises the importance of ongoing consultation and notification.

6.13 Consultation report

A summary report on all EP-specific consultations undertaken up to the date of issue of this EP is included as Appendix C. The summary report contains:

- a summary of the engagement with each relevant person
- an assessment of the merits of any objection or claim about the adverse impact of each activity to which the environment plan relates.

The summary report is intended to be made public with this EP and does not contain any sensitive information.

A detailed report, also referred to as the ‘sensitive information part’, pertaining to EP-specific consultations undertaken up to the date of issue of this EP is provided to NOPSEMA as a Sensitive Information Appendix. In accordance with Regulation 9AB, the ‘sensitive information part’ is removed prior to publication.

The detailed report includes:

- names of the relevant persons consulted
- dates consultations occurred
- method of consultation
- specifics of the consultation, including feedback provided.

In addition, if Esso and a relevant person are unable to reach agreement, there is a broad objection (e.g. to resource exploitation) or differing views, such as on the significance of an environmental impact or risk, the consultation report will demonstrate that:

- reasonable attempts have been made

- reasonably available options have been explored for resolving or mitigating the degree to which a person may be affected, particularly through control measures
- the relevant person has been informed about how their objections or claims have been addressed.

6.14 Ongoing consultation

Following the submission of this EP, Esso will continue communicating with relevant persons to provide status updates and to respond to any queries. Updates will include activities within the scope of this EP, consultation for input into the SPJ Execution EP as well as broader Esso operations. Table 6-19 outlines the ongoing consultation plans for this EP:

Table 6-19 Ongoing consultation plan

Relevant person(s)	Planned ongoing consultation mechanism	Timing
All	Information-sharing materials regarding the outcome of this submission. Continuing to respond to specific feedback received via email, phone or meetings. Ensuring the Esso website is maintained and kept up-to-date including publication of Annual Decommissioning Report. Continuing to develop and distribute regular newsletters and issues of *Connection* magazine. Commence consultation in regard to Execution activities associated with the removals work for inclusion into the Execution EP that will be submitted to NOPSEMA in 2024.	As required
Category A, B and C	Conducting regularly scheduled meetings with Commonwealth and State government departments and agencies.	As scheduled
Relevant Persons identified as marine users and relevant government departments and agencies	Notifications of commencement of activities, such as environmental and technical studies as appropriate.	2 weeks prior to activity commencing
	Notifications of vessel activities via text message or email where appropriate.	During activity

Any new relevant persons, or changes to existing relevant persons, identified during ongoing consultation will be evaluated, categorised and consulted with in accordance with the methodology outlined in Section 6.7.

7 Environmental impact and risk assessment methodology

7.1 Overview

Environmental Impact Assessment is concerned with activities that are *reasonably certain* to occur (such as planned discharges to the air or water), while Environmental Risk Assessment is concerned with unplanned events that *may possibly* occur (such as other users of the sea interacting with infrastructure decommissioned in place etc.).

Environmental impacts result from activities that are an inherent part of the decommissioning activity and will result in a change to the environment or a component of the environment, whether adverse or beneficial. For example, loss of biota attached to any removed portions of the jacket structures is an impact on the environment that cannot be avoided, while the retention of biota on the sections of the jacket decommissioned in place is a beneficial impact on the environment.

Environmental risks result from unplanned activities where a change to the environment or component of the environment may occur. Risk is a combination of the impact or consequence of an event and the associated likelihood of the event occurring. For example, a loss of fishing catch may occur if fishing gear interacts with structures decommissioned in place. The risk of this event is determined by assessing the consequence or environmental impact and the likelihood of this event happening (which may be determined qualitatively or quantitatively).

Impacts and risks associated with proposed SPJ end states were identified in accordance with ExxonMobil's *Environmental Aspects Guide* (ExxonMobil, 2012). This ExxonMobil Guide is consistent with the approach outlined in *ISO 14001 Environmental Management Systems*, *ISO 31000:2009 Risk Management* and *HB203:2012 Environmental Risk Management – Principles and Process*.

7.2 Definitions

Table 7-1 describes terms relevant to the impacts and risk assessments completed.

Table 7-1 Definitions

Activity	An activity refers to a component or task within a project which results in one or more environmental aspects.
Aspect	An environmental aspect is an element or characteristic of an activity, product, or service that interacts or can interact with the environment. Environmental aspects can cause environmental impacts.
Impact (HB203:2012)	Any change to the environment or a component of the environment, whether adverse or beneficial, wholly or partly resulting from an organisation's environmental aspects.
Risk (HB203:2012)	The effect of uncertainty on objectives. The level of risk can be expressed in terms of a combination of the consequences and the likelihoods of those consequences occurring.
Receptor	The term receptor refers to a feature of the natural and human surroundings that can potentially be impacted. This includes air, water, land, flora, and fauna (including people).

Consequence	The consequence of an impact is the outcome of the event on affected receptors. Consequence can be positive or negative.
Likelihood	The likelihood of an impact is the chance (probability) of the impact occurring.

7.3 Identification and characterisation of environmental aspects

In order to undertake meaningful impact and risk assessment, a clear understanding of the context of the assessment is required, through defining the activity and the receiving environment, and understanding any requirements (legislative or other) which are relevant to either the activity or the environment.

All components of the petroleum activity have been identified and described in Section 4. After describing the petroleum activity, an assessment was carried out to identify environmental receptors and potential interactions between the petroleum activity and the receiving environment. The existing environment in the region is described in Section 5.

In order to assess cumulative impacts, the spatial and temporal boundaries of the assessment must be set. For this EP, the following have been considered:

- Spatial – this is designed to capture all possible aspect interactions. The spatial boundaries for the assessment (the OAs) are described in Section 4.3. In addition to the spatial boundaries defined by the ten OAs covering the SPJ locations, the impact assessment also considers (where relevant) the broader aspects of operations in the Gippsland Basin, including ongoing platform and pipeline operations and well plug and abandonments.
- Temporal – this considered past, present and reasonably foreseeable future activities and environments. The temporal boundary for this assessment is the estimated duration the infrastructure remaining in-situ will be present on the seabed prior to fully degrading. This has been estimated at up to 1200 years (Kent Plc, 2022). Refer to Section 8.5.

Based upon an understanding of the environmental aspects, impacts and risks were defined and ecological and socioeconomic receptors identified, enabling a systematic evaluation to be undertaken. Feedback received during relevant person consultation (as detailed in Section 6) has been incorporated into the aspects, receptors, impacts and risks identification and evaluation.

Esso held a series of workshops in March 2022 which focussed on validating the proposed SPJ end state aspects, impacts and risks and associated control measures. Relevant person feedback received following this date has been considered against the identified aspects, impacts and risks and changes made as required.

7.4 Environmental Impact Assessment

Environmental impacts, or consequences, are evaluated in terms of the degree of the effects and the sensitivity of the environment. Esso evaluates three effects dimensions (scale, duration, and intensity) (Table 7-2) and three environmental sensitivity dimensions (irreplaceability, vulnerability, and influence) (Table 7-3) (ExxonMobil, 2012).

The determination of consequence severity involves evaluating each dimension as lower, moderate, or higher based on qualitative descriptions. Once each dimension is evaluated, results for effects and sensitivity are compared against interpretive criteria to define overall consequence severity (Table 7-6).

Table 7-2 Evaluation of environmental effect dimensions

Effect dimension	Value	Description
Duration	Short term (lower)	Hours to days; effects highly transitory.
	Medium term (moderate)	Weeks to months. Trigger/cause is temporary; effects decline over time. For chemicals, consider persistence, breakdown product, and bioaccumulation potential in determining effects duration.
	Long term (higher)	Years; effects are ongoing. For chemicals, consider persistence or bioaccumulation potential in determining effects duration.
Size/scale	Localised (lower)	Within or near an operational site, facility, etc.; affecting an area similar to or smaller than a typical operational site (for small and/or mobile sources); effects are physically contained/controlled; not a significant portion of any sensitive area.
	Moderate	Affecting an area significantly larger than a typical operational site, facility, etc.; a significant portion of a *habitat*, watershed or single ecological area; a significant portion of the range or occurrence of a population of a species.
	Widespread (higher)	Encompassing entire *ecosystems*, watersheds, or bioregions (landscape-scale); affecting most of the global range or occurrence of a species; having a noticeable impact on corporate-level *environmental performance* reporting.
Intensity	Minor (lower)	Minor changes to wildlife, *habitat*, water occurrence/drainage, or vegetation; low density. For chemical effects: low concentration or hazard* potential.
	Moderate	Moderate or partial changes to *habitat*, water occurrence/flow, ground cover, ground stability, vegetation or wildlife. For chemicals, moderate concentrations, bioaccumulation or hazard* potential; sub-lethal, non-reproductive direct or indirect effects on organisms.
	Significant (higher)	Notable changes to, fragmentation of, or elimination of *habitat*, water drainage/features, ground cover, ground stability, vegetation, and/or wildlife; for chemicals, high concentrations, bioaccumulation, or hazard* potential. Significant direct or indirect survival and/or reproductive effects on organisms.

* Chemical hazard generically includes radioactivity, reactivity, toxicity, carcinogenicity, mutagenicity, pathogenicity, reproductive effects potential, etc.

Table 7-3 Evaluation of sensitivity dimensions

Sensitivity dimension	Value	Description (applies to species, *ecosystem*, and/or *ecosystem* features/ functions/ services, all at same scale as consequence)
Irreplaceability	Lower	Common, plentiful.
	Moderate	Less common or plentiful, but not rare or unique.
	Higher	Unique or rare.
Vulnerability	Lower	Healthy, resilient, unthreatened, undamaged, or no remaining natural elements (such as some industrial settings).
	Moderate	Moderately resilient, existing stress or damage not significantly impairing function. Sustainable demand on resources/services.
	Higher	Not resilient or capable of recovery, highly stressed, threatened and/or endangered, functions/services failing (such as collapsing fishery).
Influence	Lower	Providing few or no services (supporting, regulating, provisioning, cultural).
	Moderate	Considered moderately important, providing a range of ecological, cultural, social, or commercial services for humans and biodiversity.
	Higher	Highly productive and/or bio diverse, critical for human well-being (such as subsistence), functions/services provide critical support for key human/biological communities (such as clean water), considered highly important by public.

In addition to the environmental impact evaluation, Esso also evaluates the severity of impacts on socioeconomic receptors using the community impact severity interpretation outlines in Table 7-4 and Table 7-5.

Table 7-4 Evaluation of community effect dimensions

Effect dimension	Value	Description
Duration	Short term (lower)	Hours to days; effects highly transitory
	Medium term (moderate)	Weeks to months. Trigger/cause is temporary; effects decline over time.
	Long term (higher)	Years; effects are ongoing, persistent.
Size/Scale	Localised (lower)	Limited to the close surroundings of an operating site, facility, etc.; affecting an area similar to or smaller than a typical operational site (for

Effect dimension	Value	Description
		small and/or mobile sources); effects are physically contained/controlled; affecting less than 100 people.
	Moderate	Affecting an area significantly larger than a typical operating site, facility; affecting between 100-1000 people.
	Widespread (higher)	Affecting a large portion of the community of several communities; affecting more than 1000 people.
Intensity	Minor (lower)	Minor changes to local demographics; low level of immigration; no or small number of resettlements (less than ~10 households/businesses); no or minor changes to social status, education, livelihood/income and/or community safety and security; minor effects on availability/accessibility of local goods and services; minor changes to natural and/or cultural resources (water supply, fisheries, foraging/hunting grounds, erosion protection, recreational, spiritual or cultural heritage sites, etc.) no or minor changes to local customs, traditions and lifestyles.
	Moderate	Moderate changes to local demographics; moderate level of immigration; moderate number of resettlements (less than ~10 -100 households/businesses); moderate changes to social status, education, livelihood/income and/or community safety and security not significantly affecting lifestyle; moderate effects on availability/accessibility of local goods and services; moderate changes to natural and/or cultural resources not significantly affecting functionality (water supply, fisheries, foraging/hunting grounds, erosion protection, recreational, spiritual or cultural heritage sites, etc.); moderate changes to local customs, traditions and lifestyles not significantly affecting cultural identity.
	Significant (higher)	Notable changes to local demographics; high level of immigration; high number of resettlements (greater than 100 households/businesses); significant changes to social status, education, livelihood/income and/or community safety and security notably affecting lifestyle; notable effects on availability/accessibility of local goods and services; notable changes to natural and/or cultural resources significantly affecting functionality (water supply, fisheries, foraging/hunting grounds, erosion protection, recreational, spiritual or cultural heritage sites, etc.); notable changes to local customs, traditions and lifestyles significantly affecting cultural identity.

Table 7-5 Evaluation of community sensitivity dimensions

Sensitivity dimension	Value	Interpretation (applies to communities or members of the community at the same scale as effect)
Irreplaceability	Lower	Average livelihood or income exceeds basic needs; diverse sources of livelihood/income (diverse commercial enterprises/jobs and/or diverse effective forms of agriculture/subsistence); essential goods and services readily available.

Sensitivity dimension	Value	Interpretation (applies to communities or members of the community at the same scale as effect)
	Moderate	Average livelihood or income meet but do not significantly exceed basic needs; moderately diverse sources of livelihood/income (moderate diversity of commercial enterprises/jobs and/or of effective forms of agriculture/subsistence); essential goods and services moderately available (quantity/accessibility moderately limited).
	Higher	Average livelihood or income barely meet or do not meet basic needs; Few or limited sources of livelihood/income (e.g. few if any commercial enterprises/jobs and/or few effective forms of agriculture/subsistence). Essential goods and services not or rarely available.
Vulnerability	Lower	No presence of marginalized or disadvantaged people, groups, or sub-groups (e.g., local indigenous peoples); natural and/or cultural resources (water supply, fisheries, traditional hunting/foraging grounds, erosion barriers, cultural heritage/recreational areas, spiritual sites, etc.) are healthy, resilient and undamaged; local culture and heritage (cultural identity) well integrated into present lifestyle.
	Moderate	Presence of moderately marginalized or disadvantaged people, groups, or sub-groups (e.g., local indigenous peoples); natural and/or cultural resources (water supply, fisheries, traditional hunting/foraging grounds, erosion barriers, cultural heritage/recreational areas, spiritual sites, etc.) show existing stressor damage not significantly impairing function; present lifestyle in moderate conflict with local culture and heritage (cultural identity).
	Higher	Presence of highly marginalized or disadvantaged or disadvantaged people, groups, or sub-groups (e.g., local indigenous peoples); natural and/or cultural resources (water supply, fisheries, traditional agriculture/hunting/foraging grounds, erosion barriers, cultural heritage/recreational areas, spiritual sites, etc.) show existing stress or damage significantly impairing function (e.g., collapse of fisheries, eroded stormwater protection, etc.); present lifestyle in notable conflict with local culture and heritage (cultural identity at threat of dispersal).
Social structure	Lower	Homogeneous cultural identity; no pronounced social group structure or social groups are non-adverse/share common cultural identity; local hierarchy well established and stable; low crime rate; internal community conflicts addressed in a measured manner; social support and benefits (security, education, medical care, etc.) available and accessible via local offices/ institutions or designated representatives, etc.

Sensitivity dimension	Value	Interpretation (applies to communities or members of the community at the same scale as effect)
	Moderate	Moderately homogeneous cultural identity; various cultural identities (e.g., tribes/clans) are well integrated and mostly non-adverse; moderate crime rate; internal community unrests/conflicts result in isolated confrontations without significant impairment to community safety; social support and benefits (security, education, medical care, etc.) moderately available and accessible via local offices/ institutions or designated representatives, etc., and/or moderately effective (limited staffing, several hours travel time, moderate reliability, etc.)
	Higher	Highly inhomogeneous cultural identity; dominant cultural identities (e.g., tribes/clans) display significant confrontational tendencies; high crime rate; internal community unrests/conflicts significantly impair community safety; basic human rights for others not regarded; social support and benefits (security, education, medical care, etc.) mostly unavailable or inaccessible and/or mostly ineffective (multiple days travel time, low reliability, etc.)

Table 7-6 Determination of environmental and public impact consequence

Consequence level	Environmental impact	Public impact	Interpretative examples of environmental consequence dimension considerations
I	Potential widespread, long term, significant adverse effects	• Extended (>3 months) national or international media coverage; • Large community disruption or evacuation (>1000 people); • Closure of major transportation route >24 hours.	Sensitivity of receptors are higher; Effects are longer term and widespread and/or of a higher intensity.
II	Potential localised, medium term, significant adverse effects	• National media coverage; • Medium community disruption or evacuation (100–1000 people); • Closure of major transportation <24 hours.	Sensitivity of receptors are moderate or higher; Effects are medium to long term and/or have a moderate to higher intensity.
III	Potential short term, minor adverse effects	• Public complaints; small community impact (<100 people); • Closure of secondary transportation route <24 hours;	• Sensitivity of receptors are lower to moderate; Effects are medium term and/or moderate intensity, or • Sensitivity of receptors is lower, but Effects are

Consequence level	Environmental impact	Public impact	Interpretative examples of environmental consequence dimension considerations
		• Tier 1 Process Safety Event.	longer term/higher intensity, or • Effects are localised, short term and/or low intensity, regardless of receptor sensitivity.
IV	Inconsequential or no adverse effects	• Public complaint; • Temporary closure of minor transportation route. • Minor inconvenience.	Sensitivity of receptors are lower; Effects are generally short term, localised and of low to moderate intensity.

Socioeconomic (public impact) consequence (e.g. impact on commercial fisheries) is defined in four levels, I-IV as per the *Risk Matrix Application Guide* (ExxonMobil , 2018) by the scope of the disruption and the size of the population affected.

7.5 Environmental Risk Assessment

7.5.1 Determination of consequence

When assessing the consequence of an unplanned event, the same methodology is used as for determining the consequence of a planned event (as described in Section 7.4).

7.5.2 Determination of probability

Once the most severe environmental consequence of an unplanned event is assessed, the probability of the unplanned event occurring is assessed. This is done by assessing the probability for each failure, event, or condition necessary to produce the impact.

In order to ensure that the highest possible risk is identified, scenarios with a lower severity consequence but higher probability and potentially a higher overall risk are also considered. The five categories of probability are as shown in Table 7-7.

Table 7-7 Probability categories

Probability range	Qualitative interpretation guidance	Quantitative interpretation guidance (probability of occurring per year of exposure)
A	**Very likely** Similar event has occurred once or more at site in the last 10 years. Has happened several times at site or many times in Company.	0.1 to 1

Probability range	Qualitative interpretation guidance	Quantitative interpretation guidance (probability of occurring per year of exposure)
B	**Somewhat likely** Has happened once before at site or several times in Company.	0.01 to 0.1
C	**Unlikely** Has not happened before at site or has happened a few times in Company.	0.001 to 0.01
D	**Very unlikely** Have been isolated occurrences in Company or has happened several times in industry.	0.0001 to 0.001
E	**Very highly unlikely** Has happened once or not at all in Company. Has happened a few times or not at all in industry.	<0.0001

7.5.3 Determining significance of risk

The combination of consequence severity and probability of occurrence determines the level of risk. ExxonMobil's risk framework considers existing controls when determining risk. The overall risk category is given on the basis of the likelihood of the consequence occurring after application of the control measures. The effectiveness of control measures was considered when determining the likelihood of events with control measures in place, i.e. factors such as functionality, availability, reliability, survivability, independence and compatibility of control measures, were considered.

ExxonMobil classifies risk into four categories as follows:

- **Category 1:** A higher risk that should have specific controls established in the short term and be reduced as soon as possible.
- **Category 2:** A medium risk that should be reduced unless it is not "reasonably practicable" to do so. Reasonably practicable is:
- The level of resource expenditure is not significantly disproportionate in relation to the resulting decrease of risk.
- **Category 3:** A medium risk that should be reduced if "lower cost" options exist to do so. Lower cost denotes follow-up work that can be completed without:
- Allocating extensive engineering, technical, and operations staffing or;
- The need for unit shutdowns or activities which may introduce other risks or use resources that may be more appropriately used to address higher risk category items
- **Category 4:** A lower risk that is expected to be effectively managed in base OIMS practices

- Typically requires 'No Further Action'
- Risk control measures that are in place to manage the risk to Category 4 should be continued.

Risk matrix shown in Figure 7-1.

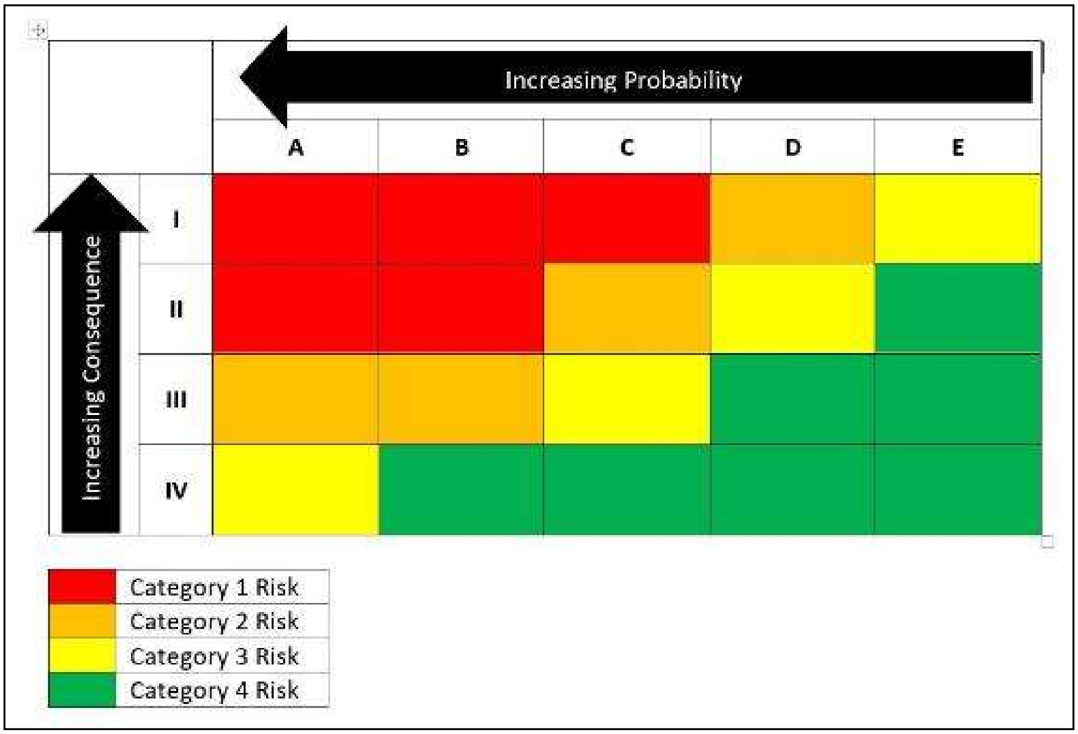


Figure 7-1 Risk matrix

7.6 Demonstration of As Low As Reasonably Practicable

Control measures are selected to reduce either the consequence of an impact or risk, or the likelihood of an unplanned event occurring. Control measures that are required by legislation are adopted regardless of the evaluated impact or risk level. In some cases, the risk or impact level will be so low that no control measures can be identified which reduce the consequence or likelihood further.

The OPGGS (Environment) Regulations Section 13(5)(c) requires that the EP details how the control measures will be used to reduce the impacts and risks of the activity to ALARP and to an acceptable level.

ALARP is achieved if the cost involved in reducing the risk further would be grossly disproportionate to the benefit gained. The ALARP principle arises from the fact that infinite time, effort and money could be spent attempting to reduce a risk or impact to zero. Where good practice controls measures do not sufficiently reduce the risk or impact level, consideration of additional control measures may be required, including undertaking an assessment of impacts or risks, costs and environmental benefits for identified control measures.

NOPSEMA's guideline *Environment Plan decision making* (NOPSEMA, 2021c) states that in order to demonstrate ALARP, a titleholder must be able to implement all available control measures where the cost is not grossly disproportionate to the environmental benefit gained from implementing the control measure.

There is no universally accepted guidance to applying the ALARP principle to environmental assessments. In alignment with NOPSEMA's guidance note *ALARP* (NOPSEMA, 2020a), Esso has adapted the approach developed by Oil and Gas UK (OGUK) (OGUK, 2014) for use in an environmental context to determine the assessment technique required to demonstrate that potential impacts and risks are ALARP (Figure 7-2).

Specifically, the framework considers impact severity and several guiding factors:

- activity type
- risk and uncertainty
- relevant person influence.

'Good practice' controls, (as discussed in Section 7.6.1) are considered sufficient demonstration of ALARP in cases where the risk is relatively well understood, the potential impacts are low, activities are well practised, and there are no conflicts with company values nor significant media interest. This is referred to as a 'Type A Decision'.

An 'Engineering risk assessment' is required to demonstrate ALARP in cases where there is greater uncertainty or complexity around the activity and/or risk, the potential impact is moderate, it may attract local media attention and some persons may object. This is referred to as a 'Type B Decision'.

A 'Type C Decision' typically involves sufficient complexity, high potential impact, uncertainty, or relevant person influence to require a precautionary approach. In this case, relevant 'Good practice' controls (as discussed in Section 7.6.1) still must be in place, Engineering risk assessment is required, and the precautionary approach applied for those controls that only have a marginal cost benefit.

Based on the criteria presented in Figure 7-2 the activities in this EP have been assessed as primarily fitting within Decision Context B. Hence a combination of 'Good practice' and 'Engineering risk assessment' techniques have been applied to each aspect in Section 8.

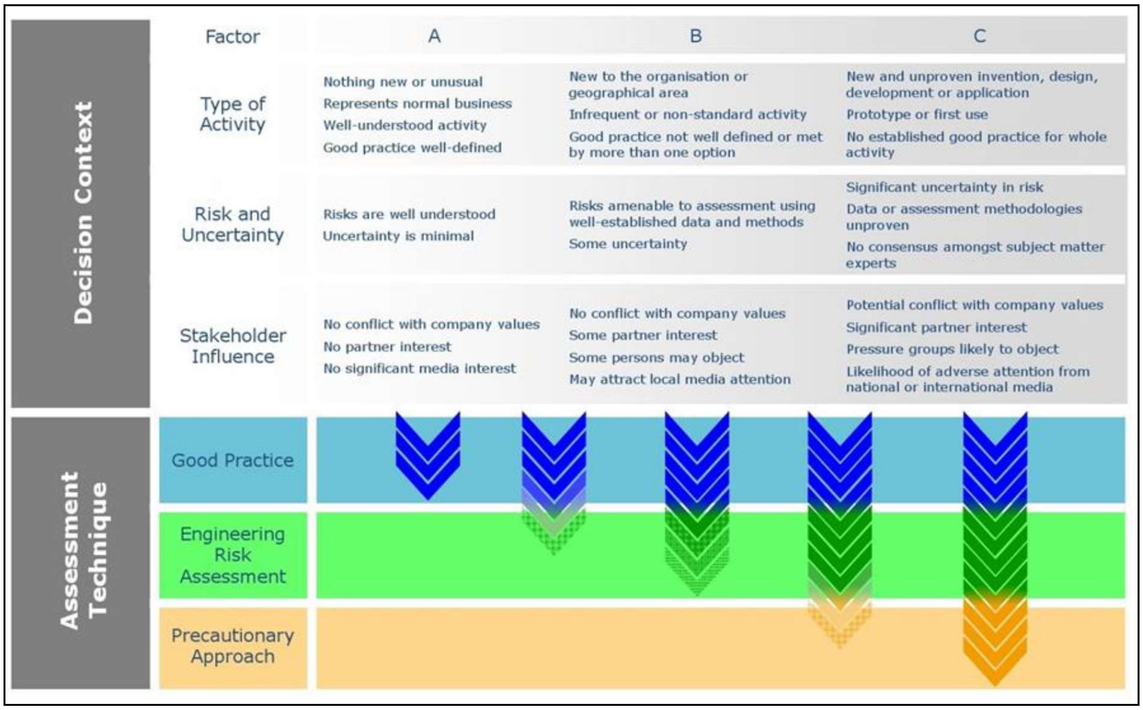


Figure 7-2 As Low As Reasonably Practicable decision support framework

7.6.1 Good practice

OGUK (2014) defines ‘Good practice’ as: "The recognised risk management practices and measures that are used by competent organisations to manage well-understood hazards arising from their activities".

‘Good practice’ can also be used as the generic term for those measures that are recognised as satisfying the law. For this EP, sources of ‘Good practice’ include:

- requirements from Australian legislation and regulations
- relevant Australian policies
- relevant Australian Government guidance
- relevant industry standards
- relevant international conventions.

If the ALARP technique is determined to be ‘Good practice’ (Type A), further assessment (‘Engineering risk assessment’) is not required to identify additional controls. However, additional controls that provide a suitable environmental benefit for an insignificant cost are also identified.

7.6.1.1 Engineering risk assessment

All impacts and risks that require further assessment are subject to an ‘Engineering risk assessment’ in which an assessment of risks, costs, and environmental or socio community benefit is conducted (OGUK, 2014).

7.6.2 Precautionary approach

OGUK (2014) states that if the assessment, considering all available engineering and scientific evidence, is insufficient, inconclusive, or uncertain, then a precautionary approach to hazard management is needed.

A precautionary approach will mean that environmental considerations are expected to take precedence over economic considerations, and a control measure that may reduce environmental impact is more likely to be implemented.

7.7 Demonstration of acceptable levels

One of the objects of the OPGGS (Environment) Regulations is to ensure that any petroleum activity carried out in an offshore area is carried out in a manner such that environmental impacts and risks will be of an acceptable level. This is also one of the key criteria for acceptance of an EP.

The acceptable level of environmental impact and risk for each receptor needs to be defined before the EPOs can be decided and the evaluation of those impacts and risks can take place.

An ‘acceptable level’ is the specified amount of environmental impact and risk that the activity may have which would not be inconsistent with relevant principles, not compromise management/conservation/protection objectives. The process involves the attainment of relevant person /wider-community views in defining acceptable levels.

Esso considers a range of factors when evaluating the acceptability of environmental impacts or risks associated with its activities. This evaluation is based on several factors, as outlined in Table 7-8 and is based on NOPSEMA’s guidance note on *Environment Plan content requirement* (NOPSEMA, 2020b).

These factors are used to demonstrate acceptability in Sections 8 and 9.

Table 7-8 Demonstration of acceptability test

<table>
<tr><th>Factor</th><th colspan="2">Demonstration of acceptability</th></tr>
<tr><td>Risk assessment process for unplanned event</td><td colspan="2">The level of environmental risk is either Category 2, 3 or 4.</td></tr>
<tr><td>Consequence assessment for planned event</td><td colspan="2">The level of environmental consequence is 3 or below.</td></tr>
<tr><td rowspan="2">Principles of Ecologically Sustainable Development (ESD)</td><td>Principles of ESD as per EPBC Act Section 3A</td><td>Applicability to this EP</td></tr>
<tr><td>Decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations.</td><td>This principle is inherently met through the EP assessment process. This principle is not considered separately for each acceptability evaluation.</td></tr>
</table>

Factor	Demonstration of acceptability	
	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.	An evaluation is completed to determine if the activity will result in serious or irreversible environmental damage. Where the activity has the potential to result in serious or irreversible environmental damage, further assessment is undertaken to determine if there is significant uncertainty in the evaluation.
	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.	Where the potential impacts and risk are determined to be serious or irreversible the precautionary principle is implemented to ensure the environment is maintained for the benefit of future generations.
	The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making.	Impact assessment is used to assess whether there are significant impacts to relevant receptors to ensure that biological diversity and ecological integrity is conserved.
	Improved valuation, pricing and incentive mechanisms should be promoted.	Not relevant to this EP.
Legislative and other requirements	All good practice control measures have been identified for the aspect. Acceptable levels identified in relevant EPBC listed species recovery plans or approved conservation advices have been considered. Impacts and risks (where applicable) considered to be consistent with the requirements, expectations and principles of the relevant plans. Impact and risk assessment considers if there are any MNES in the area of the activity and if so, undertakes the activity in a manner that will not have a significant impact on MNES as described by the significant impact criteria in *Matters of National Environmental Significance - Significant impact guidelines 1.1* (Department of the Environment, 2013). This includes consideration of the activity in its broadest scope and where possible, adopts control measures to avoid or reduce impacts to MNES. Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the reasonable exercise of right conferred by the titles granted, per OPGGS Act Section 280.	
Internal context	All Esso management system standards and impact or risk control processes have been identified for the aspect.	
External context	Relevant person feedback has been considered during preparation of the EP.	

8 Environmental Impact Assessment

8.1 Overview

The purpose of the Environmental Impact Assessment is to ensure that all impacts associated with the proposed SPJ end states are identified and evaluated, and the resulting impacts are demonstrated to be ALARP and acceptable according to the Esso impact and risk assessment methodology, as outlined in Section 7.

The assessment of impacts has been undertaken in two stages:

- impact scoping (refer to Section 8.2)
- detailed evaluation (refer to Section 8.3-8.6).

This EP will be revised where additional information through upcoming studies or other means results in changes to the assessment of impacts and risks.

8.2 Impact scoping

Scoping of the impacts relevant to the proposed SPJ end states (refer Table 8-1) ensures that a systematic assessment is undertaken. The context of the impact assessment has been provided by the description of the activity (Section 4) and identification of potential environmental receptors within the OA (Section 5). By considering the relationship between environmental aspects and the activity, Esso has identified the impacts to receptors which could potentially occur as a result of the proposed SPJ end states.

The assessment of impacts has considered direct, indirect and cumulative impacts, as defined in Section 7.2.

A series of workshops were held to identify environmental impacts and risks associated with the proposed SPJ end states and assess controls to ensure impacts and risks are managed to ALARP and an acceptable level. The workshops were attended by environment, structural engineering, offshore projects, risk assessment, management and decommissioning engineering personnel.

Impacts and risks were evaluated using the impact assessment methodology (Section 7.4) to determine consequence to receptors and ALARP decision context.

Control measures were identified, and an assessment of acceptability was undertaken against Esso's acceptability criteria and the defined acceptable levels of environmental performance (Table 7-8).

For most aspects identified, it was determined that impacts were reduced to ALARP and to an acceptable level. Further literature analysis, or site-specific studies were in some circumstances required to support the evaluation and assessment of potential impacts to receptors. These impact evaluations, and the outcomes of the assessment, are described in Sections 8.3-8.5.

EPOs and EPSs relevant to impacts associated with the proposed SPJ end states are provided in Section 10.

Throughout the remainder of this EP, 'infrastructure' is used when referring collectively to the lower sections of the SPJs and the upper sections of some SPJs placed on the seabed.

8.2.1 Steel Piled Jackets end states Environmental Impact Assessment

Table 8-1 Steel Piled Jacket end states – Impact scoping

<table>
<tr><th>Proposed end state</th><td colspan="6">Lower sections of HLA, FTA, KFA, CBA, MKA, KFB, WKF and FLA SPJs (including strut footings where present and foundation piles below the seabed) decommissioned in place – jackets cut to ensure a minimum 55m clearance below MSL.</td></tr>
<tr><th>Aspect</th><td>Physical presence – Impact on other marine users.</td><th>Impact</th><td colspan="4">Change to the function, interest or activities of other users.
Change to the function, interests or activities of other users could occur through disruption of commercial shipping activities.
Disruption to activities may include displacement of shipping from the most direct route, resulting in incremental transit time.</td></tr>
<tr><th rowspan="2">Affected receptor</th><th rowspan="2">Consequence evaluation</th><th colspan="2">Demonstration of ALARP</th><th>Demonstration of acceptability</th><th colspan="2" rowspan="2">Assessment outcome</th></tr>
<tr><th>Good practice control measures</th><th>Additional control measures considered</th><th>Acceptability assessment</th></tr>
<tr><td rowspan="4">Commercial vessels</td><td rowspan="4">All SPJs are currently located within the ATBA and are subject to a TSS which directs commercial vessels around the Bass Strait facilities. Vessels in excess of 200 gross tonnage are prohibited from entering the ATBA.
It is considered that at some point in the future (after the cessation of all petroleum activities) the ATBA and TSS may be removed. Hence a more direct route between Wilsons Promontory to Cape Howe could be chosen by vessels transiting through Bass Strait. This has been estimated to save approximately 13 minutes per return trip from Sydney to Melbourne (AMC Search, 2022a).
A risk assessment carried out by AMC Search in 2022 concluded that "removal at 55m will not affect the passage of merchant vessels of current design characteristics" (AMC Search, 2022b). It was also assessed that it is "unlikely that the deepest clearances will increase substantially due to the significant amount of dredging that would be required to allow access for much larger vessels to Australian ports" (AMC Search, 2022a).
The minimum 55m vessel clearance was assessed as adequate for clearance even under extreme weather events and for the largest vessels.
Hence the physical presence of the lower sections of the SPJs remaining in place will not impact future shipping, as there is no impediment to vessels in the future choosing a more direct route through the area, should the ATBA and TSS be removed.
AMSA was consulted on the proposed SPJ end state options during the preparation of this EP. AMSA stated during this consultation that a 55m clear water column would be adequate from a safety of navigation perspective, consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989).</td><td rowspan="4">CM1: Where the water depth allows, SPJs to be cut at a depth which is consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989).
CM2: Locations of remaining SPJ sections to be identified on navigational charts administered by the AHO to advise marine users of their presence.</td><td rowspan="4">Physical marking of SPJ sections remaining in place – the provision of such navigational aids is not considered to further reduce the impact to commercial vessels, given the good practice control measures adopted.</td><td rowspan="4">Impact is Consequence Level III or less.
Impact is well understood.
Principles of ESD met:
• no significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved
• activity will not result in serious or irreversible damage
Good practice control measures have been defined and implemented
Control measures are consistent with Esso's Environment Policy (Appendix B).
The activity meets ExxonMobil OIMS objectives and the intent of Project Environmental Standards (ExxonMobil, 2021b).
Relevant person feedback has been considered.</td><th>Consequence Level</th><td>IV</td></tr>
<tr><th>ALARP decision context</th><td>Type A</td></tr>
<tr><th>ALARP outcome</th><td>ALARP</td></tr>
<tr><th>Acceptability outcome</th><td>Acceptable</td></tr>
</table>

<table>
<tr><th>Proposed end state</th><td colspan="6">SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – cut as close as practicable to the seabed (without large scale dredging).</td></tr>
<tr><th>Aspect</th><td>Physical presence – Impact on other marine users.</td><th>Impact</th><td colspan="4">Change to the function, interest or activities of other users.
Change to the function, interests or activities of other users could occur through disruption of commercial shipping activities.
Disruption to activities may include displacement of shipping from the most direct route, resulting in incremental transit time.</td></tr>
<tr><th rowspan="2">Affected receptor</th><th rowspan="2">Consequence evaluation</th><th colspan="2">Demonstration of ALARP</th><th>Demonstration of acceptability</th><th rowspan="2" colspan="2">Assessment outcome</th></tr>
<tr><th>Good practice control measures</th><th>Additional control measures considered</th><th>Acceptability assessment</th></tr>
<tr><td rowspan="4">Commercial vessels</td><td rowspan="4">Due to the water depth at WTA (54m) and BMA (59m), the SPJs at these locations will be cut as close to the seabed as practicable – which may be either below the seabed, or up to 5m above the seabed, depending on the feasibility of internal or external cutting methods. For WTA an unobstructed water column of at least 55 metres cannot be achieved due to the water depth (54m), and for BMA, depending on the depth of cut that can be achieved during execution, an unobstructed water column of 55m may not be achieved.

The dynamic clearance, which takes into account the effects of waves causing a vessel to move up and down in the vertical plane, was calculated for a vessel with a sailing clearance of 18m (AMC Search, 2022b). The dynamic clearance was calculated at various wave heights expected to be experienced in Bass Strait based on hind cast data. The maximum dynamic clearance for a vessel of this size transiting Bass Strait, including a safety factor of 50% to take account of potential under-estimation due to vessel roll and a further 30% safety factor as recommended by the Maritime and Coastguard Agency UK, was calculated to be 38.2m (AMC Search, 2022b). In comparison, the water clearance expected to be achieved over the BMA SPJ footings is at least 54m, while for the WTA SPJ the water clearance is expected to be at least 49m.

The predicted most direct route through Bass Strait which could be taken by commercial vessels in the future, should the ATBA and TSS be removed, does not pass over the WTA or BMA locations, with the closest point of this route estimated to be over 6 nautical miles from BMA (AMC Search, 2022a).

Hence the physical presence of the SPJ footings remaining in place at WTA and BMA is not expected to impact future shipping, as there is no impediment to vessels in the future choosing a more direct route through the area, should the ATBA and TSS be removed.</td><td rowspan="4">CM2: Locations of remaining infrastructure to be identified on navigational charts administered by the AHO to advise marine users of the presence of remaining infrastructure.</td><td rowspan="4">None</td><td rowspan="4"></td><th>Consequence Level</th><td>IV</td></tr>
<tr><th>ALARP decision context</th><td>Type A</td></tr>
<tr><th>ALARP outcome</th><td>ALARP</td></tr>
<tr><th>Acceptability outcome</th><td>Acceptable</td></tr>
</table>

<table>
<tr><td>Proposed end state</td><td colspan="7">Lower sections of HLA, FTA, KFA, CBA, MKA, KFB, WKF and FLA SPJs (including strut footings where present and foundation piles below the seabed) decommissioned in place – jackets cut to ensure a minimum 55m clearance below MSL.
SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – cut as close as practicable to the seabed (without large scale dredging).</td></tr>
<tr><td>Aspect</td><td>Physical presence – Interference with other marine users
Presence of remaining infrastructure can lead to impacts on other marine users (fishing and future industries).</td><td>Impact</td><td colspan="5">Change to the function, interest or activities of other users.
Change to the function, interests or activities of other users could occur through disruption of commercial and recreational activities.
Impacts on activities may include:
• continued displacement of commercial fishing activities from the SPJ sections remaining in place
• interference with recreational activities (fishing/boating)
• benefits to recreational fishing by enhanced access to fishing areas.
Prevention of the use of the SPJ footprint area by future potential marine industries (wind farms, wave energy, aquaculture etc.).</td></tr>
<tr><td rowspan="2">Affected receptor</td><td colspan="2" rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td colspan="2" rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Commercial fishing</td><td colspan="7">Detailed evaluation in Section 8.3.</td></tr>
<tr><td rowspan="4">Leisure /recreational activities (fishing, boating, diving)</td><td colspan="2" rowspan="4">Leisure activities may occur within the vicinity of the infrastructure remaining in place such as recreational fishing and recreational boating. Recreational diving is not a credible activity to be considered, given the maximum depth advanced recreational divers can dive is 40m (130ft).
Given the water depths and the unobstructed water column of minimum 55m provided, the physical presence of the SPJs remaining in place are unlikely to interfere with recreational boating activities.
Species targeted by recreational fishers were identified as being present around the facilities during review of historical ROV footage (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b) and visual analysis of footage obtained during Environmental Survey 1 (Summer) (AIMS, 2022a). These include trevally, mackerel and ocean perch. Feedback from recreational fishing groups obtained during relevant person engagement on end state options for the SPJ facilities provided anecdotal evidence that the Esso facilities are known to attract game fish and that recreational fishers would favour the retention of as much structure as possible.
The retention of the lower sections of the SPJs in place and the future removal of PSZs that currently restrict access to recreational fishing is expected to provide enhanced opportunities for recreational fishing in the OAs.</td><td rowspan="4">CM3: Removal of the PSZs around the SPJs will provide enhanced access for recreational fishing opportunities.</td><td rowspan="4">None</td><td rowspan="4">Impact is Consequence Level III or less.
Impact is well understood.
Principles of ESD met:
• no significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved
• activity will not result in serious or irreversible damage.
The activity meets ExxonMobil OIMS objectives and the intent of Project Environmental Standards (ExxonMobil, 2021b).
Relevant person feedback has been considered.</td><td>Consequence Level</td><td>IV</td></tr>
<tr><td>ALARP decision context</td><td>Type A</td></tr>
<tr><td>ALARP outcome</td><td>ALARP</td></tr>
<tr><td>Acceptability outcome</td><td>Acceptable</td></tr>
</table>

Proposed end state	Lower sections of HLA, FTA, KFA, CBA, MKA, KFB, WKF and FLA SPJs (including strut footings where present and foundation piles below the seabed) decommissioned in place – jackets cut to ensure a minimum 55m clearance below MSL. SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – cut as close as practicable to the seabed (without large scale dredging).					
Future industries	Due to the presence of the deep foundation piles and plugged and abandoned wells, any decommissioning option for the SPJs (including complete removal below the seabed) will prevent other future marine industries, such as offshore wind from installing facilities over the immediate footprint areas of the SPJs. In December 2022, a 15,000km area in Bass Strait was declared by the Minister for Climate Change and Energy as being suitable for offshore renewable energy. This area extends from Lakes Entrance to south of Wilsons Promontory and encompasses the SPJ OAs (DCCEEW, Unlocking the Power of offshore wind in Gippsland , 2022). As such, this impact assessment has focused on the offshore wind power industry. The Star of the South wind farm project is currently in the early feasibility stage. The Star of the South proposal is for 200 turbines to be installed in a licence area off the south coast of Gippsland in Bass Strait. The wind farm is proposed to be located 7-25km off the coast, in 20-40m water depth (Star of the South, 2022a). The Vena Energy Pty Ltd Blue Marlin Offshore Wind Project is proposing to install up to 140 wind turbines across four stages off the coast of Wellington Shire in Gippsland (Vena Energy Australia, 2022). The Flotation Energy Pty Ltd Seadragon project is proposing a wind farm project which overlaps with part of the Campaign #1 OAs. The Seadragon project is proposing the installation of up to 150 wind turbine generators installed on foundations secured into the seabed, likely to be fixed jacket or monopile designs. Floating foundations will also be considered (Floatation Energy Pty Ltd, 2020). Fixed foundation wind farms are typically restricted to water depths of less than 60 metres, however floating turbines are nearing commercialisation and can be deployed in deeper water (Briggs, et al., 2021). It is considered that given the extensive area in Bass Strait expected to be suitable for wind farm development and the small overall footprint of the SPJ infrastructure remaining in place, any impacts to the planning or viability of future projects are expected to be low as demonstrated by the consideration of the Seadragon project Consultation with AMSA has been undertaken regarding the SPJ decommissioning options. AMSA indicated they must give consideration to other users of the sea, including potential future renewable energy projects. Esso provided AMSA with further detail reiterating that no decommissioning option for the SPJs (including removal to below to seabed) would result in the ability for future projects to install infrastructure directly over the immediate SPJs footprint.	None identified.	None	Impact is **Consequence Level III** or less. Impact is well understood. Principles of ESD met: • no significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved • activity will not result in serious or irreversible damage. The activity meets ExxonMobil OIMS objectives and the intent of *Project Environmental Standards* (ExxonMobil, 2021b). Relevant person feedback has been considered.	**Consequence Level** **ALARP decision context** **ALARP outcome** **Acceptability outcome**	**IV** Type A ALARP Acceptable

Proposed end state	Lower sections of HLA, FTA, KFA, CBA, MKA, KFB, WKF and FLA SPJs (including strut footings where present and foundation piles below the seabed) decommissioned in place – jackets cut to ensure a minimum 55m clearance below MSL. SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – cut as close as practicable to the seabed (without large scale dredging).

Aspect	Retention of the SPJ lower sections (below 55m) leading to the retention of sessile biota associated with these sections.	**Impact**	Retention of species abundance/diversity. Sessile biota (i.e. macroalgae, bivalves, barnacles, crustacea sponges and cnidarians) present on the lower sections of the SPJs will be retained.

Affected receptor	**Consequence evaluation**	**Demonstration of ALARP**		**Demonstration of acceptability**	**Assessment outcome**
		Good practice control measures	**Additional control measures considered**	**Acceptability assessment**	
Sessile biota	Detailed evaluation provided in Section 8.5.				

Aspect	Retention of the SPJ lower sections (below 55m), leading to retention of habitat and food sources for fish and other mobile marine species.	**Impact**	Retention of habitat and food sources. Retention of the SPJ lower sections (below 55m), will retain the habitat and food sources present for fish species (including the endangered white shark) and other mobile marine biota such as mobile invertebrates Australian fur seals and cetaceans.

Affected receptor	**Consequence evaluation**	**Demonstration of ALARP**		**Demonstration of acceptability**	**Assessment outcome**
		Good practice control measures	**Additional control measures considered**	**Acceptability assessment**	
Fish and mobile invertebrates Australian fur seal White shark Cetaceans	Detailed evaluation provided in Section 8.4.				

Aspect	Retention of the SPJ lower sections (below 55m), leading to retention of Gippsland Basin ecosystem richness and diversity as a result of structures contributing to productivity and connectivity (cumulative impacts).	**Impact**	Retention of species abundance/diversity observed on the SPJ lower sections (below 55m). Evidence for oil and gas structures facilitating seascape connectivity exists for larvae and mobile adult invertebrates, fish and megafauna; including threatened and commercially important species (McLean, et al., 2022).

Affected receptor	**Consequence evaluation**	**Demonstration of ALARP**		**Demonstration of acceptability**	**Assessment outcome**
		Good practice control measures	**Additional control measures considered**	**Acceptability assessment**	
Sessile biota Fish and mobile invertebrates White shark Cetaceans	Detailed evaluation provided in Section 8.4.				

<table>
<tr><td>Proposed end state</td><td colspan="6">Lower sections of HLA, FTA, KFA, CBA, MKA, KFB, WKF and FLA SPJs (including strut footings where present and foundation piles below the seabed) decommissioned in place – jackets cut to ensure a minimum 55m clearance below MSL.
SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – cut as close as practicable to the seabed (without large scale dredging).</td></tr>
<tr><td>Aspect</td><td>Long term degradation of remaining SPJs leading to constituent (iron, chromium, copper, nickel) dissolution into immediate waters and sediments.</td><td>Impact</td><td colspan="4">Injury/mortality to fauna.
Exposure to metals may cause acute and chronic toxicity effects to sessile marine biota encrusted on the jacket, living in the sediment (infauna) or using the jacket structure as habitat.
Bioaccumulation of metals may also cause impacts to higher trophic levels (i.e. predators).</td></tr>
<tr><td rowspan="2">Affected receptor</td><td rowspan="2" colspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Sessile biota</td><td rowspan="2" colspan="6">Detailed evaluation provided in Section 8.5.</td></tr>
<tr><td>Sediment infauna</td></tr>
<tr><td>Aspect</td><td>Degradation of sacrificial anodes remaining on SPJs leading to constituent (aluminium, cadmium, copper, chromium, nickel, zinc) dissolution into immediate waters and sediments.</td><td>Impact</td><td colspan="4">Injury/mortality to fauna.
Exposure to metals may cause acute and chronic toxicity effects to sessile marine biota encrusted on the jacket, living in the sediment (infauna) or using the jacket structure as habitat.
Bioaccumulation of metals may also cause impacts to higher trophic levels (i.e. predators).</td></tr>
<tr><td rowspan="2">Affected receptor</td><td rowspan="2" colspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Fish and mobile invertebrates</td><td colspan="6">Detailed evaluation provided in Section 8.5.</td></tr>
<tr><td>Aspect</td><td>Degradation of remaining SPJs, leading to gradual disintegration and collapse.</td><td>Impact</td><td colspan="4">Change in habitat.
Degradation of the lower sections of the SPJs will lead to a change in habitat for marine fauna, by a loss of habitat higher up in the water column as the structure collapses, and subsequent creation of hard substrate on the seabed in the collapse zone.</td></tr>
<tr><td rowspan="2">Affected receptor</td><td rowspan="2" colspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Sessile biota</td><td rowspan="2" colspan="6">Detailed evaluation provided in Section 8.5</td></tr>
<tr><td>Fish and mobile invertebrates</td></tr>
</table>

<table>
<tr><td>Proposed end state</td><td colspan="7">Lower sections of HLA, FTA, KFA, CBA, MKA, KFB, WKF and FLA SPJs (including strut footings where present and foundation piles below the seabed) decommissioned in place – jackets cut to ensure a minimum 55m clearance below MSL.
SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – cut as close as practicable to the seabed (without large scale dredging).</td></tr>
<tr><td>Aspect</td><td>Degradation of remaining SPJs, leading to gradual disintegration and collapse.</td><td>Impact</td><td colspan="5">Injury/mortality to fauna.
Smothering or crushing of marine fauna may occur in the event of an instantaneous collapse of the structure, or a section of the remaining structure falling to the seabed.</td></tr>
<tr><td rowspan="2">Affected receptor</td><td colspan="3" rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Sessile biota</td><td colspan="7" rowspan="2">Detailed evaluation provided in Section 8.5</td></tr>
<tr><td>Sediment infauna</td></tr>
<tr><td>Aspect</td><td>Degradation of grout, leading to constituent dissolution into immediate waters and sediments.</td><td>Impact</td><td colspan="5">No impact expected.</td></tr>
<tr><td rowspan="2">Affected receptor</td><td colspan="3" rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Sessile biota</td><td colspan="3" rowspan="3">Detailed evaluation provided in Section 8.5.</td><td colspan="4" rowspan="3">No impact expected.</td></tr>
<tr><td>Sediment infauna</td></tr>
<tr><td>Fish and mobile invertebrates</td></tr>
</table>

Proposed end state	SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – cut as close as practicable to the seabed (without large scale dredging).		
Aspect	Internal cutting of the SPJ piles at BMA and WTA is not feasible and dredging of the seabed is required to allow external cutting to be undertaken.	**Impact**	Injury/mortality to fauna. Direct physical impact (including smothering) can lead to a loss of benthic infauna and sessile biota present in the dredged area of seabed and the area where dredge spoil is placed.

Affected receptor	Consequence evaluation	Demonstration of ALARP: Good practice control measures	Demonstration of ALARP: Additional control measures considered	Demonstration of acceptability: Acceptability assessment	Assessment outcome	
Sessile biota Sediment infauna	If internal cutting of the piles at BMA and WTA is not feasible (this cannot be assessed until removal of the topsides), external cutting of these two SPJs may be required in order to facilitate the optimum cut pattern for removal as close as practicable to the seabed. This may result in some localised limited dredging of the seabed to allow the cutting equipment to access a suitable external cutting location. Estimated dredge volumes for BMA and WTA are included in Appendix A6. In the areas where seabed material is removed, sessile benthic fauna and infauna that is too slow or unable to move away is likely to be buried or smothered as sediments become mobile in the water column and then settle back on the seabed. Small sessile fauna that are filter or suspension feeders are the most vulnerable category to impacts from dredging, including mussels, barnacles, small sessile worms and sponges (AECOM Australia Pty Ltd, 2011). Impacts from smothering as a result of dredging will be limited to close proximity of the WTA and BMA SPJs. Infauna at WTA was sampled during Environmental Survey 1 (Summer) and while communities show natural small scale variation, are mostly homogenous and similar to reference sites, with no particular areas of value or sensitivity. The sessile biota observed in the benthic surrounds at WTA during Environmental Survey 1 (Summer) is provided in Section 8.4.2.6. In summary, it was observed that biota cover and height were low in the benthic surrounds of WTA, with a low percent cover of jewel anemone (<1%) and sponges (<1.5%) (AIMS, 2022a). BMA was not surveyed as part of Environmental Survey 1 (Summer) as a representative number of SPJs were chosen to represent water depths and geographical spread across Bass Strait. BMA is in similar water depth to WTA, hence the results from WTA are considered to be representative of BMA. Impacts on sessile biota and infauna as a result of the potential limited dredging around WTA and BMA are expected to be localized and no long-term changes to benthic ecosystems are anticipated. Any impacts are expected to be inconsequential or have no adverse effects.	None identified.	None.	Impact is **Consequence Level III** or less. Impact is well understood. Principles of ESD met: • no significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved • activity will not result in serious or irreversible damage. The activity meets ExxonMobil OIMS objectives and the intent of *Project Environmental Standards* (ExxonMobil, 2021b). No relevant person feedback has been received in relation to this impact.	**Consequence Level**	**IV**
					ALARP decision context	Type A
					ALARP outcome	ALARP
					Acceptability outcome	Acceptable

<table>
<tr><th>Proposed end state</th><td colspan="6">SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – cut as close as practicable to the seabed (without large scale dredging).</td></tr>
<tr><th>Aspect</th><td>Internal cutting of the SPJ piles at BMA and WTA is not feasible and some small scale, localised dredging of the seabed is required to allow external cutting to be undertaken.</td><th>Impact</th><td colspan="4">Change in water quality.
Seabed disturbance as a result of dredging can lead to increased turbidity and potential release of contaminants within the sediments, which affects water quality.</td></tr>
<tr><th rowspan="2">Affected receptor</th><th rowspan="2">Consequence evaluation</th><th colspan="2">Demonstration of ALARP</th><th>Demonstration of acceptability</th><th colspan="2" rowspan="2">Assessment outcome</th></tr>
<tr><th>Good practice control measures</th><th>Additional control measures considered</th><th>Acceptability assessment</th></tr>
<tr><td>Fish and mobile invertebrates
Sessile biota
Sediment infauna</td><td>Turbidity is expected to resolve in a short period of time following the completion of dredging. Larger, mobile fauna such as fish and crabs have the ability to move away from the sediment plume generated by dredging and are likely to be less affected however localised turbidity may impact gill function in impacted individuals.
Turbidity impacts are likely to be short term and temporary – as sediments will settle and water quality will return to pre disturbance levels.
Sediment sampling was undertaken around WTA during Environmental Survey 1 (Summer) and analysed for metals, PAHs and naturally occurring radioactive material (NORM). The results of the analysis are presented in Section 5.3.3. These results indicate that few samples taken around WTA have elevated concentrations of contaminants relative to screening levels (Hook S. E., et al., 2021). This suggests there is not widespread or significant contamination around WTA based on screening values.
Impacts on marine biota as a result of short-term changes to water quality due to the potential small scale, limited dredging around WTA and BMA are expected to be localised and no long-term impacts are anticipated.
Any impacts of small scale, limited dredging around WTA and BMA, should this be required are expected to be inconsequential or have no adverse effects.</td><td>None.</td><td>None.</td><td>Impact is Consequence Level III or less.
Impact is well understood.
Principles of ESD met:
• no significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved
• activity will not result in serious or irreversible damage
• no control measures identified which can further lower the impact consequence.
The activity meets ExxonMobil OIMS objectives and the intent of Project Environmental Standards (ExxonMobil, 2021b).
No relevant person feedback has been received in relation to this impact.</td><td>Consequence Level
ALARP decision context
ALARP outcome
Acceptability outcome</td><td>IV
Type A
ALARP
Acceptable</td></tr>
</table>

8.2.2 End fate of removed sections of jacket

Two options for the disposal of the removed upper sections of the SPJs are being evaluated:

- Disposal option #1: removed SPJ sections placed adjacent to the lower sections of the SPJ remaining in place, entirely within the title area (placement option relevant for HLA, CBA, MKA, KFA, KFB, WKF and FLA) or
- Disposal option #2: removed SPJ sections transported to an ORC for dismantling and processing for disposal.

The results of the impact scoping for Disposal option #1 has been presented in Table 8-2. Results of the evaluation of the environmental impacts and risks of Disposal option #2 have been presented in Section 8.6 of this EP (these are indirect impacts and risks as a consequence of removing property from the title areas).

Table 8-2 Placement adjacent to Steel Piled Jacket lower sections remaining in place – Impact scoping

<table>
<tr><th>Activity</th><td colspan="7">Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL.</td></tr>
<tr><th>Aspect</th><td>Physical presence – Interference with other marine users.</td><th>Impact</th><td colspan="5">Change to the function, interest or activities of other users.
Disruption to activities may include:
• displacement of shipping from the most direct route, resulting in small incremental transit time
• continued displacement of commercial fishing activities from the infrastructure locations
• interference with recreational activities (fishing/boating)
• benefits to recreational fishing by enhanced access to fishing areas.
Prevention of the use of the footprint area of the placed sections of jacket by future potential marine industries (wind farms, wave energy, aquaculture etc.)</td></tr>
<tr><th rowspan="2">Affected receptor</th><th rowspan="2" colspan="2">Consequence evaluation</th><th colspan="2">Demonstration of ALARP</th><th>Demonstration of acceptability</th><th rowspan="2" colspan="2">Assessment outcome</th></tr>
<tr><th>Good practice control measures</th><th>Additional control measures considered</th><th>Acceptability assessment</th></tr>
<tr><td rowspan="4">Commercial vessels</td><td rowspan="4" colspan="2">Placing some sections of the removed SPJ sections adjacent to the remaining lower sections will not result in any incremental impacts to commercial vessels over those identified for the jacket lower sections remaining in place (outlined in Table 8-1).
SPJ sections will be cut and placed to ensure a minimum 55m clearance below MSL is achieved.</td><td rowspan="4">CM11: Removed sections will be cut and placed so as to ensure clearance is consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989).
CM12: Locations of removed SPJ sections placed on the seabed will be identified on navigational charts to advise other users of their presence.</td><td rowspan="4">None.</td><td rowspan="4">Impact is Consequence Level III or less.
Impact is well understood.
Principles of ESD met:
• activity will not result in serious or irreversible environmental damage
• good practice control measures identified.
The activity meets ExxonMobil OIMS objectives and the intent of Project Environmental Standards (ExxonMobil, 2021b).
No relevant person feedback has been received in relation to this impact.</td><th>Consequence Level</th><td>IV</td></tr>
<tr><th>ALARP decision context</th><td>Type A</td></tr>
<tr><th>ALARP outcome</th><td>ALARP</td></tr>
<tr><th>Acceptability outcome</th><td>Acceptable</td></tr>
<tr><td>Commercial fishing</td><td colspan="7">Detailed evaluation in Section 8.3.</td></tr>
</table>

Activity	Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL.					
Recreational activities (fishing, boating, diving)	Placing some sections of the removed SPJs adjacent to the lower sections remaining in place will not result in any incremental impacts to recreational activities over those identified for the SPJ lower sections remaining in place (outlined in Table 8-1). Incremental benefits to recreational fishing activities may be expected as a result of the placement of some removed sections of SPJs adjacent to the lower sections, as the additional hard substrate will provide an expanded area to be utilised for recreational fishing activities.	None identified.	**CM3**: Removal of the PSZs around the SPJs will provide enhanced access for recreational fishing opportunities.	Impact is **Consequence Level III** or less. Impact is well understood. Principles of ESD met: • activity will not result in serious or irreversible environmental damage • no control measures identified which can further lower the impact consequence. The activity meets ExxonMobil OIMS objectives and the intent of *Project Environmental Standards* (ExxonMobil, 2021b). No relevant person feedback has been received in relation to this impact.	**Consequence Level** **ALARP decision context** **ALARP outcome** **Acceptability outcome**	**IV** Type A/B ALARP Acceptable
Future industries	Refer to consequence evaluation for this aspect and receptors in Table 8-1. The incremental footprint on the seabed as a result of the placement of some sections of removed SPJ adjacent to the SPJ lower sections will be small as placement is expected to occur within close proximity to the SPJ lower sections. For the purpose of this EP, placement as close as practicable to the SPJ lower sections has been assumed. Any incremental impacts over those identified for the SPJ lower sections remaining in place to future marine projects as a result of the physical presence of some SPJ sections being placed on the seabed are expected to be inconsequential.	**CM12**: Locations of removed SPJ sections placed on the seabed will be identified on navigational charts to advise other users of their presence.	**CM13:** Removed sections of SPJs will be placed on the seabed as close as practicable to the lower SPJ sections remaining in place.	Impact is **Consequence Level III** or less. Impact is well understood. Principles of ESD met: • activity will not result in serious or irreversible environmental damage • good practice control measures identified. The activity meets ExxonMobil OIMS objectives and the intent of *Project Environmental Standards* (ExxonMobil, 2021b). Relevant person feedback has been considered.	**Consequence Level** **ALARP decision context** **ALARP outcome** **Acceptability outcome**	**IV** Type A/B ALARP Acceptable

<table>
<tr><td>Activity</td><td colspan="6">Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL.</td></tr>
<tr><td>Aspect</td><td>Relocation of removed section(s) of jacket to deeper depths.</td><td>Impact</td><td colspan="4">Injury/mortality to fauna.
Certain species of encrusting marine biota present on the SPJs may be lost due to environmental requirements (light/nutrients) not being present in deeper water.</td></tr>
<tr><td rowspan="2">Affected receptor</td><td colspan="2" rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Sessile biota</td><td colspan="6">Detailed evaluation in Section 8.4.</td></tr>
<tr><td>Aspect</td><td>Relocation of removed section(s) of jacket to deeper depths.</td><td>Impact</td><td colspan="4">Change in habitat.
Fish which require certain environmental conditions found in the sections of jacket closer to the surface will be_unlikely to migrate to the placed sections of jacket in deeper water.</td></tr>
<tr><td rowspan="2">Affected receptor</td><td colspan="2" rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Fish</td><td colspan="6">Detailed evaluation in Section 8.4.</td></tr>
</table>

<table>
<tr><td>Activity</td><td colspan="6">Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL.</td></tr>
<tr><td>Aspect</td><td>Relocation of upper section(s) of jacket to deeper depths, resulting in an increase in hard seabed habitat.</td><td>Impact</td><td colspan="4">Retention of habitat.
Placement will mitigate some of the habitat reduction enacted by removal of the top sections of jacket.</td></tr>
<tr><td rowspan="2">Affected receptor</td><td colspan="2" rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Sessile biota</td><td colspan="6" rowspan="2">Detailed evaluation in Section 8.4.</td></tr>
<tr><td>Fish</td></tr>
</table>

<table>
<tr><td>Activity</td><td colspan="6">Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL.</td></tr>
<tr><td>Aspect</td><td>Seabed disturbance.
Disturbance of seabed sediments as a result of placement of removed section(s) on the seabed.</td><td>Impact</td><td colspan="2">Injury/mortality to fauna.
Direct physical impact (including smothering) can lead to a loss of benthic infauna present in the placement area.</td><td colspan="2">Change in habitat.
Alteration to benthic habitats can occur as a result of seabed disturbance.</td></tr>
<tr><td rowspan="2">Affected receptor</td><td rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td colspan="2" rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td rowspan="4">Benthic infauna</td><td rowspan="4">Benthic infauna communities within the Bass Strait show natural small scale variation, however the area is mostly considered homogenous. Site specific sampling conducted by Esso (AECOM Australia Pty Ltd, 2021) demonstrates similarities in taxa but variation in composition between different sites.
Seabed disturbance from the placement of cut sections of jackets on the seabed will be limited to close proximity to the jacket lower sections. Infauna and communities within the OAs show natural small-scale variation, however, are mostly homogenous, with no particular areas of value or sensitivity. It is possible that activities will produce a slight alteration of the local habitat and community structure due to the small amount of changed substrate in an area of uniform soft sediments; however the naturally homogenous nature of the benthic infauna communities in the area within which placement would occur will result in quick recovery, and no long-term changes to ecosystem are expected. Any impacts are expected to be inconsequential or have no adverse effects.</td><td rowspan="4">None</td><td rowspan="4">CM13: Removed sections of SPJs will be placed on the seabed as close as practicable to the lower SPJ sections remaining in place.</td><td rowspan="4">Impact is Consequence Level III or less.
Impact is well understood.
Principles of ESD met:
• no significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved
• activity will not result in serious or irreversible damage
• no further control measures identified which can further lower the impact consequence.
The activity meets ExxonMobil OIMS objectives intent of Project Environmental Standards (ExxonMobil, 2021b).
No relevant person feedback has been received in relation to this impact.</td><td>Consequence Level</td><td>IV</td></tr>
<tr><td>ALARP decision context</td><td>Type A</td></tr>
<tr><td>ALARP outcome</td><td>ALARP</td></tr>
<tr><td>Acceptability outcome</td><td>Acceptable</td></tr>
</table>

<table>
<tr><td>Activity</td><td colspan="7">Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL.</td></tr>
<tr><td>Aspect</td><td>Seabed disturbance.
Disturbance of seabed sediments as a result of placement of removed section(s) on the seabed.</td><td>Impact</td><td colspan="5">Change in water quality.
Seabed disturbance can lead to increased turbidity and potential release of contaminants within the sediments, which affects water quality.</td></tr>
<tr><td rowspan="2">Affected receptor</td><td rowspan="2" colspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2" colspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td rowspan="4">Ambient water quality</td><td rowspan="4" colspan="2">Water quality change occurs when seabed sediments enter the water column (turbidity).
Suspension of sediments and the subsequent change in water quality may impact local fish species or encrusting organisms by physical smothering, or exposure to potential contaminants in the sediments.
Turbidity impacts are likely to be short term and temporary –as sediments will settle and water quality will return to pre disturbance levels.
In terms of exposure of marine biota to potential contaminants in the sediments, the concentrations of metals and PAHs measured in sediment samples collected around the existing SPJs in 2021 (Hook S. E., et al., 2021) concluded that concentrations rarely exceeded the higher screening levels for the analytes sampled, suggesting there is not widespread nor significant contamination of sediments around the SPJs based on screening values.
Any impacts will be localised and temporary and ambient water quality will return to background levels following seabed disturbance. As such impacts are expected to be inconsequential and no adverse impacts are expected to ecological receptors as a result of a change in water quality.</td><td rowspan="4">None.</td><td rowspan="4">None.</td><td rowspan="4">Impact is Consequence Level III or less.
Impact is well understood.
Principles of ESD met:
• no significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved
• activity will not result in serious or irreversible damage
No control measures identified which can further lower the impact consequence.
The activity meets ExxonMobil OIMS objectives and the intent of Project Environmental Standards (ExxonMobil, 2021b).
No relevant person feedback has been received in relation to this impact.</td><td>Consequence Level</td><td>IV</td></tr>
<tr><td>ALARP decision context</td><td>Type A</td></tr>
<tr><td>ALARP outcome</td><td>ALARP</td></tr>
<tr><td>Acceptability outcome</td><td>Acceptable</td></tr>
</table>

<table>
<tr><td>Activity</td><td colspan="7">Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL.</td></tr>
<tr><td>Aspect</td><td>Long term degradation of additional jacket steel structure placed on the seabed – leading to incremental constituent (iron, chromium, copper, nickel) dissolution into immediate waters and sediments.</td><td>Impact</td><td colspan="5">Injury/mortality to fauna.
Exposure to metals can cause acute toxicity effects to sessile marine biota encrusted on the jacket, living in the sediment (infauna) or using the jacket structure as habitat.
Bioaccumulation of metals can also cause impacts to higher trophic levels (i.e. predators).</td></tr>
<tr><td rowspan="2">Affected receptor</td><td colspan="3" rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Sessile biota
Sediment infauna</td><td colspan="7">Detailed evaluation in Section 8.5.</td></tr>
<tr><td>Aspect</td><td>Degradation of additional sacrificial anodes remaining on the SPJ lower sections, leading to incremental constituent (aluminium, cadmium, copper, chromium, nickel, zinc) dissolution into immediate waters and sediments.</td><td>Impact</td><td colspan="5">Injury/mortality to fauna.
Exposure to metals can cause acute toxicity effects to sessile marine biota encrusted on the jacket, living in the sediment (infauna) or using the jacket structure as habitat.
Bioaccumulation of metals can also cause impacts to higher trophic levels (i.e. predators).</td></tr>
<tr><td rowspan="2">Affected receptor</td><td colspan="3" rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Sessile Biota
Fish</td><td colspan="7">Detailed evaluation in Section 8.5.</td></tr>
<tr><td>Aspect</td><td>Degradation of remaining SPJ steel structure, leading to gradual disintegration and collapse of the structures.</td><td>Impact</td><td colspan="5">Injury/mortality to fauna.
Smothering of marine fauna may occur in the event of an instantaneous collapse of the structure, or a section of the remaining structure falling to the seabed.
Change in habitat.
Degradation of the remaining structure will lead to a change in habitat for marine fauna, by a loss of habitat higher up in the water column as the structure collapses, and subsequent creation of hard substrate on the seabed in the collapse zone.</td></tr>
<tr><td rowspan="2">Affected receptor</td><td colspan="3" rowspan="2">Consequence evaluation</td><td colspan="2">Demonstration of ALARP</td><td>Demonstration of acceptability</td><td rowspan="2">Assessment outcome</td></tr>
<tr><td>Good practice control measures</td><td>Additional control measures considered</td><td>Acceptability assessment</td></tr>
<tr><td>Sessile Biota and infauna
Fish</td><td colspan="7">Detailed evaluation in Section 8.5.</td></tr>
</table>

8.3 Impacts to other users of the sea (commercial fishing operations)

8.3.1 Description

This Section provides an evaluation of the impacts to commercial fishing that may occur as a result of the proposed SPJ end states. Commercial fishing is currently excluded from an area of 500 metres around the locations of the Esso SPJ facilities due to the presence of PSZs around each facility, which have been in place since their installation. The retention of infrastructure in place will likely result in the ongoing exclusion of some commercial fishing methods from the immediate footprint of the infrastructure remaining in place. Vessels employing fishing methods that involve trawling will need to continue to avoid these locations, as the infrastructure remaining in place will not be over trawlable.

Interaction with the structures may result in damage to fishing equipment and subsequent economic impacts from a loss of current/future catch and having to repair/replace equipment. The risks of a commercial vessel fishing over, and interacting with, the infrastructure remaining in place are evaluated in Section 9.3. This Section addresses only the impacts of the ongoing exclusion of relevant commercial fishing methods from the locations of the infrastructure remaining in place. The unplanned event (risk) of a vessel fishing over, and interacting with, the infrastructure remaining in place is evaluated in Section 9.3.

Esso commissioned the Australian Maritime College (AMC Search, 2022c) to undertake a review of the potential impacts and risks to commercial fishing in Bass Strait from the end state options under consideration. Esso also commissioned SETFIA to provide data on commercial fishing methods, effort and areas currently fished in the vicinity of the SPJs (SETFIA, 2022). The outcomes of these two studies have been used to inform this impact assessment.

8.3.1.1 Commercial fishing effort overview

The marine habitat offshore of southeast Victoria has a variety of seafood that supports numerous State and Commonwealth managed fisheries. Section 5.6.1 of this EP provides detail on the commercial fishing types and effort in the OAs. There are 23 Commonwealth and State commercial fisheries which are permitted to fish in the vicinity of the OAs in the Gippsland Basin, however, only 12 of these fisheries are currently actively fished (SETFIA, 2022). The predominant fishing methods in the area of the Esso facilities are: Danish seine; demersal (bottom) trawling; and demersal gillnets. Over the past 10 years, the annual fishing effort for trawling and Danish seine has either remained stable or decreased depending on the fishing method, while catch value has decreased over the same period.

8.3.1.2 Commercial fishing methods overview

Many forms and variations of fishing equipment are used in the harvest of seafood from Bass Strait. Table 8-3 provides a summary of the commercial fishing methods used in the vicinity of the OAs and their potential to be impacted by the presence of the infrastructure remaining in place.

Table 8-3 Predominant fishing methods and effort in the vicinity of the Operational Areas

Fishing method used	Fishing effort in OAs	Potential impact to fishing method from proposed SPJ end states
Danish seine	17 vessels in 2020.	Yes – as ropes drag on the seabed.

Fishing method used	Fishing effort in OAs	Potential impact to fishing method from proposed SPJ end states
Demersal (bottom) fish trawl	9 vessels in 2020.	Yes – otter boards drag on seabed.
Dredge	<5 vessels since 2011.	Yes – as dredge is towed along the seabed.
Purse seine	1 vessel in 2020.	Yes – if net is allowed to sink to lower depths than pelagic species.
Demersal gillnet	11 vessels in 2020.	Yes – gillnets are positioned on seabed.
Mid-water fish trawl	SETFIA advised unlikely to be used in OAs.	Unlikely.
Vertical dropline	<5 vessels since 2011.	Unlikely – vertical orientation.
Demersal horizontal longline	<5 vessels since 2011.	Unlikely – SETFIA advises uncommon for fishing equipment to snag on seabed.
Squid jigging	None in 2020.	Unlikely – fishing equipment does not interact with the seabed.
Octopus trap	Data not provided by State authority where less than 5 vessels.	Unlikely because of the layout of the fishing equipment used.
Craypot	Data not provided by State authority where less than 5 vessels.	Unlikely because of the layout of the fishing equipment used.

The fishing methods that have been assessed as being potentially impacted by the proposed SPJ end states are discussed below.

8.3.1.3 Danish seine

The Danish seine method, as shown in Figure 8-1, is the predominant fishing method used near the OAs. Danish seine is used to catch finfish species that have a strong association with the seabed, such as flathead and whiting. The way the fishing equipment is set and recovered allows vast areas of seabed to be swept (i.e. fished) in a relatively short period of time. The use of long ropes attached to either side of the net places the net up to 1400 metres from the vessel during the towing and recovery phase (AMC Search, 2022c).

The presence of netting and its flexible nature means that the net is prone to becoming tangled with seabed obstacles as it travels over the seabed. The long ropes are also prone to getting caught on obstacles.

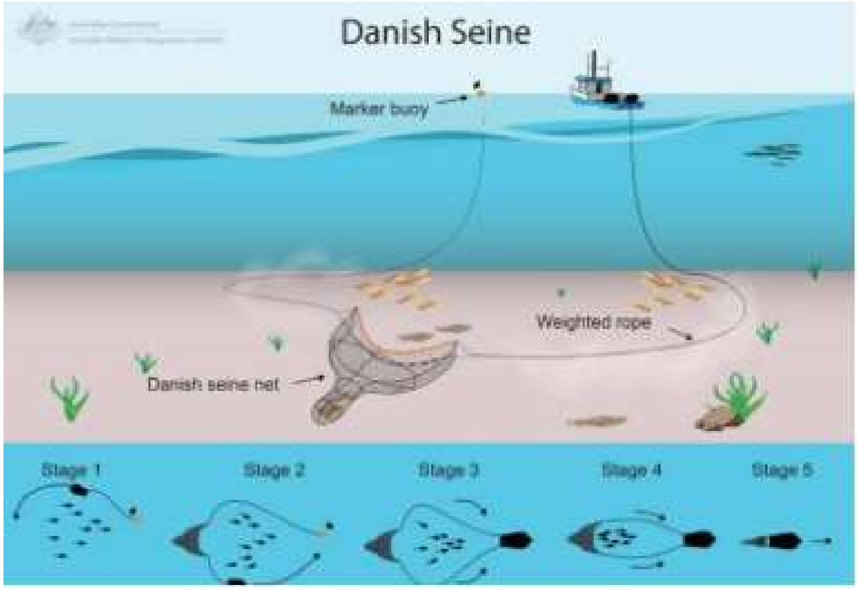


Figure 8-1 Danish seine main gear components and fishing method

8.3.1.4 Demersal (bottom) fish trawl

Demersal (bottom) fish trawl, as shown in Figure 8-2, is used to catch primarily finfish species located near the seabed. The gear relies heavily on long wires (sweep and lower bridle) between the otterboards and net to come into ground contact and herd fish inwards to the mouth of the net.

The presence of netting and its flexible nature means that the trawl net is prone to becoming tangled with seabed obstacles as it travels over the seabed. The lower bridle and sweep wires that can be seen in Figure 8-2 below are also prone to getting caught on obstacles, whereas the otterboards usually bounce off or ride over most obstacles (AMC Search, 2022c).

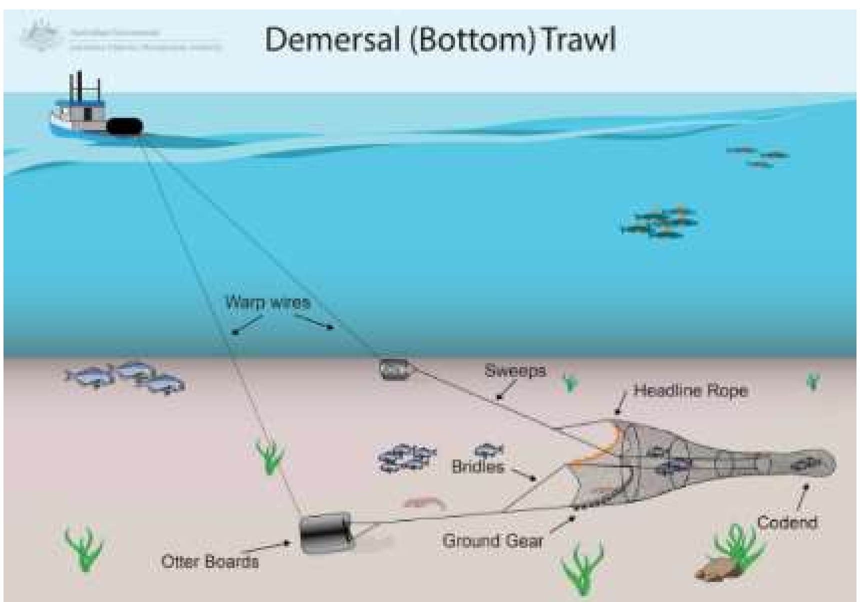


Figure 8-2 Demersal (bottom) fish trawl main gear components

8.3.1.5 Scallop dredge

The scallop dredge fishing method, as shown in Figure 8-3, is used for catching scallops and other molluscs on the seabed. Since the scallops are often partially buried and located in the troughs of sand waves, the dredge is equipped with a toothed flat bar across its leading edge, which enables it to penetrate into the substrate (100-150 millimetres) and scoop the target species into the metal cage located immediately downstream. Dredges are relatively simple to use and are towed in Bass Strait in depths ranging from 44-89 metres, or shallower if required (AMC Search, 2022c).

The absence of netting and other flexible components means that the rigid steel box dredge is unlikely to become entangled with a seabed obstacle. However, due to its weight and the need to dig into the soft substrate, the box dredge is very prone to coming fast against a large obstacle, although with some manipulation from the vessel, it is most likely to detach/come free relatively easily.

Figure 8-3 Scallop dredge main gear components

8.3.1.6 Purse seine

Purse seines, as shown in Figure 8-4, are used to harvest small pelagic finfish (sardine, mackerel, redbait) and sometimes larger fish such as Australian salmon. The net is set up around a fish school, usually with the aid of sonar to keep track of the fishes' whereabouts whilst the net is being set.

When the fish are relatively deep the skipper will let the net sink longer before "hauling in" on both ends of the purse wire. Occasionally this may result in the net touching the seabed if the water is relatively shallow e.g. less than 60 metres. A purse seine used in Bass Strait for small pelagic fish would be about 600 metres in length and fish in water of about 70 meters depth (AMC Search, 2022c).

The presence of netting and its flexible nature means that the net is prone to becoming tangled with seabed obstacles should it descend to such depths and be drawn across the seabed.

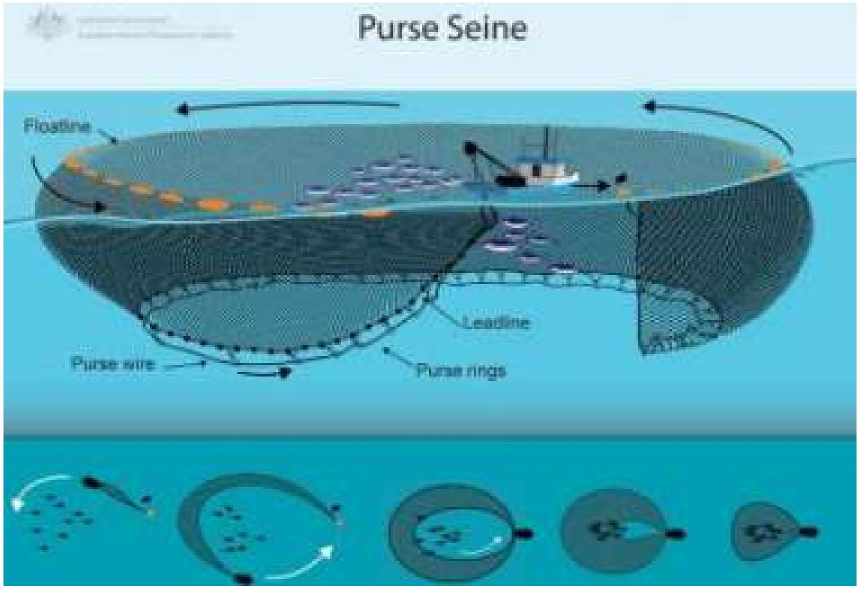


Figure 8-4 Purse seine main net components and fishing method

8.3.1.7 Demersal gillnet

Demersal gillnets, as shown in Figure 8-5, are used to harvest shark and a range of finfish species. The wall of netting is set on the bottom in a line and held in place at each end by anchors. In areas of strong current and on long nets, intermediate anchors will be used. The net sits on the seabed for a period and is then hauled from one end.

The presence of netting and its flexible nature means that the nets are prone to becoming tangled with seabed obstacles/structure.

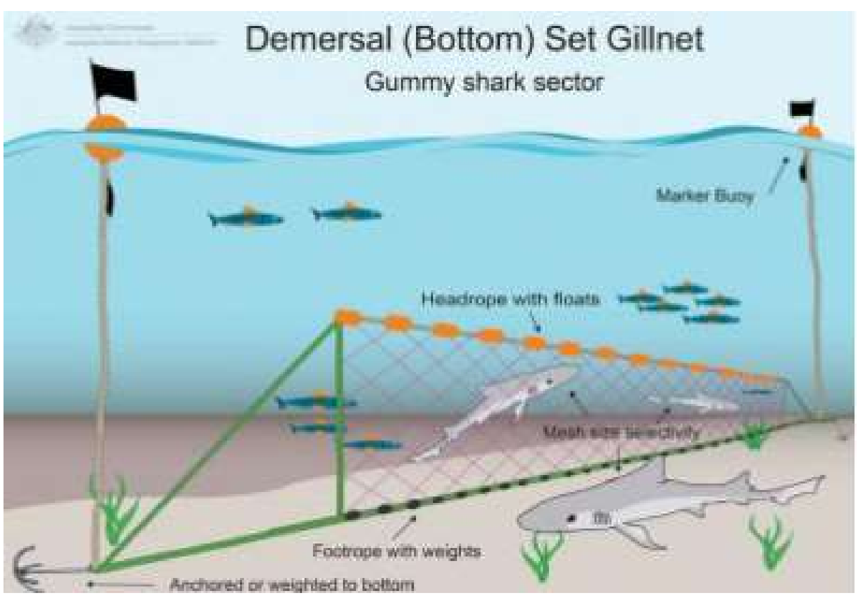


Figure 8-5 Demersal gillnet main components

8.3.2 Consequence evaluation

The proposed SPJ end states and the option of placing some upper sections of selected SPJs on the seabed will result in infrastructure remaining on the seabed, which can cause a potential snagging hazard to some commercial fishing methods as outlined in Section 8.3.1. This risk is further assessed in Section 9.3. Vessels undertaking these commercial fishing methods will need to continue to avoid the immediate footprint of the infrastructure remaining in place, until such time as this has completely degraded and no longer poses a risk of snagging.

This potential snagging hazard will not be obvious at MSL because the upper portions of the SPJs will have been removed. Key mitigations for notifying current and future commercial fishing vessels of the potential snagging hazards include updating of navigational charts and updating plotters on commercial fishing vessels to ensure the hazards are recognized. This evaluation assumes commercial fishing operators will continue to avoid the locations of the infrastructure remaining in place (due to the snagging risk) and that the immediate footprint of the infrastructure will therefore continue to be excluded from commercial fishing activity over the long term.

Commercial fishing has been excluded from the 500-metre PSZ around each SPJ facility since the installation of the SPJs. Hence there is no impact on current commercial fishing operations as a result of the ongoing presence of the infrastructure remaining in place. The potential impact is the continued exclusion from the SPJ areas which would become available for commercial fishing in the event the SPJs were removed to below the seabed to eliminate trawl hazards. Commercial fishers consulted expect that the PSZs will be removed or reduced in size. Furthermore, NOPSEMA has clarified that, if there is no operational property subject to inspection, maintenance or repair, a PSZ should be removed. It is therefore expected that the PSZs currently in place around each SPJ will be revoked following decommissioning.

All Commonwealth licenced vessels must carry Vessel Monitoring Systems so the exact locations of trawling activities are known. In 2015, this data was used to determine that approximately six percent of the seabed is trawled in the CTS (SETFIA, 2022). This amounts to approximately 34,000 square kilometres in the area between 3 nautical miles from shore and 1000 metres water depth. SETFIA noted that large areas of the CTS are closed through fishery closures and marine parks.

Assuming that commercial fishing vessels will choose to continue to avoid an approximate 500-metre zone around each of the Campaign #1 SPJs (currently the PSZs) so as to avoid the risk of snagging on the infrastructure remaining in place, a continued trawling exclusion area of approximately 8 square kilometres of seabed would result. This is equivalent to 0.4 percent of the area assessed in 2015 (see above) as being available for trawling operations in the CTS.

The effects of the ongoing exclusion of commercial fishing from a maximum area of 500 metres around the infrastructure remaining in place are expected to be long term, but localised and of low intensity.

This results in an assessed **Consequence Level IV** (inconsequential or no adverse effects).

The removal of upper sections of each SPJ will lead to a reduction in ecological habitat, leading to a possible reduction in broader commercial fishing catch if the SPJs are 'producing' commercial fish species. The impacts to marine biota and the potential ecological value that the SPJs are considered to be providing to the 'production' of commercial fish species is evaluated further in Section 8.4.6.2.

8.3.3 Controls

Good practice controls and demonstration of ALARP and acceptability are presented in Table 8-4, Table 8-5 and Table 8-6.

Table 8-4 Good practice controls

Good practice	Adopted	Control	Rationale
Notification to commercial fishing relevant persons. .	Yes	**CM2:** Locations of remaining infrastructure to be identified on navigational charts administered by the AHO to advise marine users of the presence of remaining infrastructure.	Control will ensure commercial fishers are aware of the ongoing presence of the infrastructure remaining in place.
Revocation of PSZs around the SPJs.	Yes	**CM3:** Removal of the 500-metre PSZs around the SPJs will provide enhanced access for recreational and commercial fishing opportunities.	Once the SPJs are decommissioned, it is NOPSEMAs (and commercial fishers consulted) expectation that PSZs will be revoked.

8.3.4 Demonstration of As Low As Reasonably Practicable

Table 8-5 As Low As Reasonably Practicable demonstration

ALARP decision context	Decision Context B
Justification	The impact to commercial and recreational fishing of the proposed SPJ end states has both positive and negative outcomes <u>relative to removal below the seabed</u>: • for commercial fishing methods which are precluded by the presence of the infrastructure remaining in place, the proposed SPJ end states will result in continued exclusion from a fishing area of approximately 0.4 percent of the area available for the CTS. Commercial fishers would continue to avoid the immediate area around infrastructure left in place as they have been doing for many years • for recreational fishers, the proposed end states result in retained habitat that is anticipated to support recreational fishing opportunities around the infrastructure remaining in place. Commercial fishing relevant persons have indicated at different times some interest in having the SPJs removed below the seabed, but also a recognition that such effort would be disproportionate to the risk reduction in snagging relative to the fishing benefit obtained. Commercial fishing relevant persons have also indicated that infrastructure remaining on the seabed could cause frustration due to the need to remap. Recreational fishing relevant persons have expressed support in leaving as much of the SPJs in place as possible (at a safe level below the sea surface) due to the habitat they provide for fish species. No other relevant

	persons have commented and there has been no noted media interest on this aspect. Conversely, removing SPJs below the seabed would reverse the positive and negative outcomes for the commercial and recreational fishers. That is: • for commercial fishers, the proposed SPJ end states will result in an increase in fishing area of about 0.4 percent of the area available for the CTS • there will be no benefit to recreational fishers because there will be no habitat retained. Hence Esso believes **ALARP Decision Context B** should apply. An Engineering risk assessment has been undertaken to ensure that any additional controls meriting additional environmental benefits have been identified and evaluated.

Engineering risk assessment

Additional, alternative, improved controls	Benefit	Cost/feasibility	Adopted
Remove SPJs to below the seabed.	Allows incremental area (~0.4%) for commercial fishers to fish.	This end state option has been evaluated as part of the Decommissioning Options Assessment (refer to Section 3 of this EP). This alternative control does not take into account the agreed process for evaluating options against an Equal or Better Outcome criteria which is a precursor to the ALARP and acceptability evaluations as described in Figure 3-1 and which concluded that the proposed end state option provides an equal or better outcome relative to full removal.	Not adopted.
If sections of removed jackets are placed on the seabed these will be placed on the seabed as close as practicable to the lower SPJ sections remaining in place.	Minimise the incremental seabed area impacted by the placement of removed sections of jacket on the seabed adjacent to the lower sections.	Feasible.	Adopted. **CM13.**

8.3.5 Demonstration of acceptability

Table 8-6 Demonstration of acceptability test

Factor	Demonstration criteria	Criteria met	Rationale
Impact Consequence Level	Impact is **Consequence Level III** or less.	✓	
Principles of ESD	No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved.	✓	The potential impact associated with exclusion of commercial fishing from the footprint of the infrastructure remaining in place is not considered to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	The potential impact associated with exclusion of commercial fishing from the footprint of the infrastructure remaining in place is not considered as having the potential to result in serious or irreversible environmental damage.
Legislative and other requirements	Legislative and other requirements have been identified and met.	✓	Complies with OPGGS Act Section 281 – minimum interference with other rights. Will comply with Section 572(3) and 572(7) if the End State EP is accepted.
Internal context	Consistent with Esso's Environment Policy (Appendix B).	✓	Proposed activities are consistent with Esso's Environment Policy (Appendix B), in particular, to conduct its business in a manner that is compatible with the balanced environmental and economic needs of the communities in which it operates.
	Meets *Project Environmental Standards* (ExxonMobil, 2021b).	✓	There is no specific environmental standard addressing the decommissioning of offshore infrastructure. However the activity meets the intent of the *Project Environmental Standards* (ExxonMobil, 2021b).
	Meets ExxonMobil Operations Integrity Management System (OIMS) objectives.	✓	Proposed activities meet the OIMS System 6-5 objective to identify and assess environmental aspects. Significant aspects are addressed and controlled consistent with policy and regulatory requirements.

Factor	Demonstration criteria	Criteria met	Rationale
External context	Relevant person feedback has been considered during preparation of the EP.	✓	Consultation with commercial fishing relevant persons has informed the impact assessment described in Section 8.3 and the development of control measures (specifically CM2 and CM3).

8.4 Impacts to marine biota

8.4.1 Description

The construction and presence of the SPJs creates vertical hard substrates in the marine environment. Hard substrates are rare relative to soft bottom sediment in the ocean (Macreadie, Fowler, & Booth, 2011). Many marine organisms utilise hard substrate as habitat and opportunistically colonise SPJs (OGUK, 2013a) and promote biodiversity across trophic levels. In the marine environment, high relief and structurally complex reefs such as those provided by the SPJs, are associated with higher abundance and diversity of marine organisms (Advisian, 2017).

To further understand the marine biota supported by the SPJs and the impacts of the proposed end states on this biota, a review of historic ROV imagery obtained from Bass Strait SPJs between 2008 - 2018 was undertaken (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b). A targeted offshore field survey, referred to as 'Environmental Survey 1 (Summer)', was then completed at and around the Bass Strait SPJs from January to March 2021.

A representative group of Bass Strait SPJs was targeted for visual analysis during Environmental Survey 1 (Summer). The SPJs were specifically selected such that they covered a range of water depths, structural characteristics, asset age, proximity to other structures, and geographic spread across the Campaign #1 area within Bass Strait (AECOM Australia Pty Ltd, 2021). The selection also considered the preliminary ecological evaluation of historic ROV footage, production status, historic and current produced formation water discharge and other operational factors. The summarised assessment outcomes are included in location specific variables which have been noted in the following sections for completeness.

Table 8-7. This selection therefore, provides information on the marine biota expected to exist on the SPJs that were not specifically surveyed, as they have similar properties to those included.

The review of newly recorded ROV imagery identified many similarities between platforms regardless of depth, geographic location and operational status. Examples of these similarities include the dominance of encrusting jewel anemone cover on all surveyed SPJs, the presence of various sponge species (largely at the base) of the SPJs, similarities in many of the identified fish species (such as scad, silver sweeps, butterfly perch and jackass morwong) and similar patterns of reduced biomass with distance from the footings. These similarities confirm the reasonableness of selecting a representative sample of SPJs to survey. Whilst there is a high degree of similarity between the SPJs, it is also recognised that there are some location specific variables which have been noted in the following sections for completeness.

Table 8-7 Summarised Bass Strait SPJ Survey Selection Basis

Platform	Production Licence No.	Distance from coast (km)	Water depth (m)	Latitude	Longitude	Year of installation	~ No. wells	Products handled	Comment
WTA	VIC/L02	34	54	38° 14' 29" S	147° 72' 20" E	1989	5	oil & gas	Included in Environmental Survey 1 (Summer) – WTA is situated in less than 60m water depth. Production was ceased at time of Environmental Survey 1 (Summer).
HLA	VIC/L05	63	73	38° 24' 20" S	148° 19' 07" E	1970	22	oil only	Included in Environmental Survey 1 (Summer) – HLA was in production at the time of Environmental Survey 1 (Summer). Near South East Reef. First generation platform.
FTA	VIC/L05	62	69	38° 28' 50" S	148° 20' 28" E	1983	31	oil only	HLA and CBA are considered geographically, structurally and operationally similar to FTA for environment assessment comparison.
CBA	VIC/L05	68	78	38° 24' 32" S	148° 16' 36" E	1983	17	oil only	Included in Environmental Survey 1 (Summer) – CBA was in production at the time of Environmental Survey 1 (Summer). Near South East Reef.
MKA	VIC/L05	72	93	38° 27' 04" S	148° 18' 28" E	1977	25	oil only	HLA and CBA considered geographically similar noting that MKA is removed from the South East Reef area. FLA considered comparative for water depth and operations history for environment assessment comparison.
KFA	VIC/L07	75	77	38° 35' 51" S	148° 08' 35" E	1971	17	oil only	Included in Environmental Survey 1 (Summer) – KFA was not operational at time of survey.
KFB	VIC/L07	77	78	38° 35' 54" S	148° 11' 11" E	1971	15	oil only	KFA considered geographically and operationally similar to KFB. KFB is

Platform	Production Licence No.	Distance from coast (km)	Water depth (m)	Latitude	Longitude	Year of installation	~ No. wells	Products handled	Comment
									of the same age and construction as KFA
WKF	VIC/L07	72	76	38° 35' 39" S	148° 06' 15" E	1982	29	oil only	KFA considered geographically and operationally similar to WKF.
FLA	VIC/L11	58	93	38° 18' 44" S	148° 26' 16" E	1984	23	oil & gas	Included in Environmental Survey 1 (Summer) - SPJ located in the deepest water depth of the Campaign 1 SPJs, not operational at time of survey
BMA	VIC/L13	46	59	38° 30' 03" S	147° 46' 15" E	1988	23	oil & gas	SPJ situated in less than 60m water depth and similar in age to WTA. Consideration given to available historic ROV footage. WTA considered comparable to BMA.

A repeat offshore survey was conducted in winter 2022 (Environmental Survey 2 (Winter)) at the same SPJ locations to investigate any seasonal and temporal variation in species abundance and richness. The combined survey data (Summer and Winter) will provide comprehensive information on the marine biota supported by the Campaign #1 SPJs in Bass Strait.

Environmental Survey 1 (Summer) obtained visual observations from:

- eight facilities (including SPJ facilities within the scope of this EP – HLA, CBA, KFA, FLA and WTA)
- their immediate benthic surrounds
- reference areas reflective of the likely pre-installation seabed state
- a natural reef area referred to as South East Reef.

Information on the age and water depths of the SPJs are included in Appendix A1.

The five selected reference locations were located at a suitable distance from the SPJs so as not to be influenced by the oil and gas installations and operations. Across these five locations, a total of 15 reference site ROV transects were completed, each 100 metres in length.

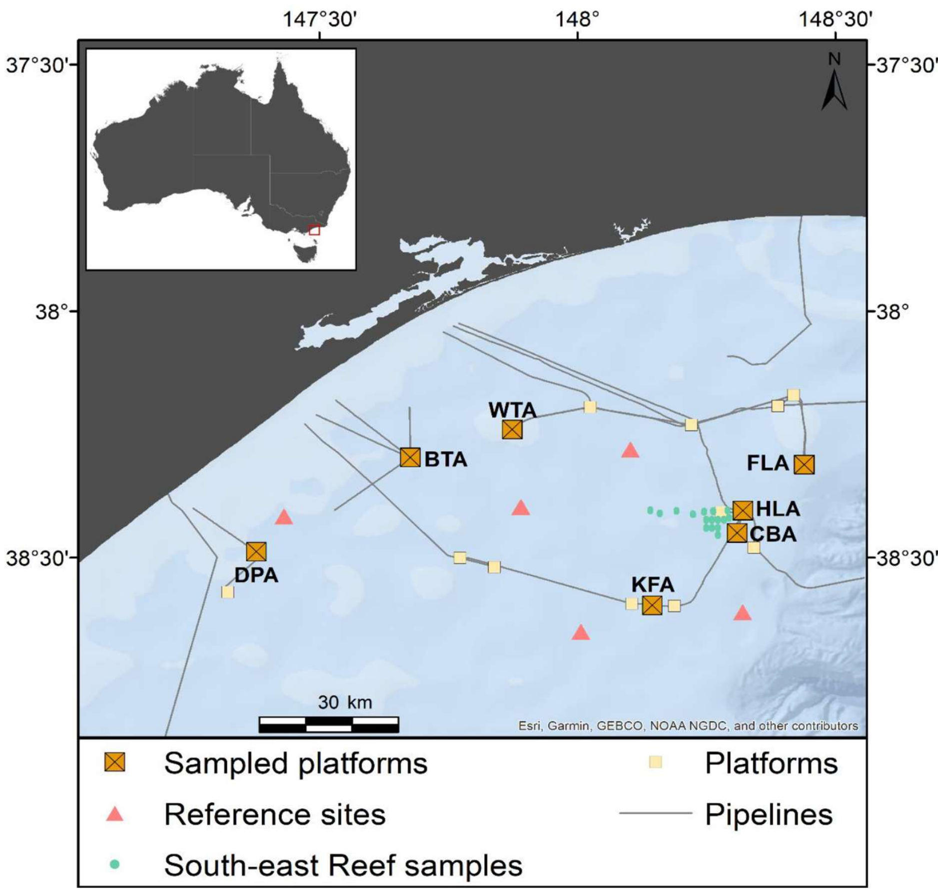
The South East Reef is a natural reef area thought to possess some low-relief limestone reef features (Bax & Williams, 2001) and is situated in approximately 70 metres water depth with the nearest SPJs being FTA, CBA and HLA (AIMS, 2022a). Twenty transects, each 500 metres long, were undertaken in the South East Reef area with the primary goal of surveying benthic habitat and analysing benthic sediments and associated communities.

Transects of the benthic surrounds of HLA, CBA, KFA, FLA and WTA were undertaken. The benthic surrounds transects were each 150 metres long and spread out from the SPJ in four directions.

In general, the ROV transects undertaken targeted all faces of each surveyed SPJ at a setback of approximately 1 metre from the SPJ for benthic surveys (from sea surface down to seabed) and approximately 5 metres setback from the structures for fish surveys (from seabed to sea surface and return).

The locations surveyed in Environmental Survey 1 (Summer) are shown in Figure 8-6. Note: DPA and BTA are not part of the scope of this EP.

Figure 8-6For context: WTA ceased production in 1997, KFA in 2019 and FLA in 2020. At the time of writing this EP, CBA and HLA are still producing but will be decommissioned as part of Campaign #1.



Note: DPA and BTA are not part of the scope of this EP.

Figure 8-6 Environmental Survey 1 (Summer) sampling locations

8.4.2 Benthic communities

8.4.2.1 Summary

Natural surrounding areas (reference sites) were dominated by sand, mud and gravel (>95 percent), with limited and patchy distribution of benthic biota (primarily sponges) (AIMS, 2022a). In contrast, all SPJs were observed to be completely covered with benthic biota ranging from macroalgae and short encrusting invertebrate complexes such as bivalves and barnacles, to sponges and cnidarians (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b). The SPJs were noted to support a very high density of biota and were far more complex in terms of three-dimensional epibenthic structure than those that were observed in the SPJ benthic surrounds, at reference sites and sampling transect points within the South East Reef (AIMS, 2022a).

The dominant observed species of benthic biota at the SPJs is discussed in more detail in the following sections.

8.4.2.2 Jewel anemone

By far, the dominant benthic biota observed on all the SPJs surveyed were cnidarians, primarily jewel anemone (*Corynactis australis*), across most depths except the seabed sections (lower 10 metres of structure). Additional anemone groups were observed in very low cover (<3 percent) (AIMS, 2022a).

A similar dominance of jewel anemone has been reported for 23 platform facilities in southern California (AIMS, 2022a). Jewel anemone are azooxanthellate, meaning they lack symbiont photosynthetic algae. They are colonial anemones, usually with distinctive knobs at the ends of their tentacles, and closely resemble the polyps of calcareous corals, but do not produce coral skeletons. They are most commonly found in reef habitats, in waters up to 30 metres in depth (Mitchell, 2010) however have been observed to form the dominant cover on all SPJS to much greater depths. The dominance of one particular species, such as the jewel anemone on the SPJs, suggests that it is capable of excluding other species that may be expected to be present (e.g. soft corals, mussels). This dominance can lead to a low benthic diversity, but could also limit the establishment of invasive species (AIMS, 2022d).

Jewel anemones exhibited notable colour variations among the SPJs and with depth from the surface to seabed (Figure 8-7 to Figure 8-10). This was noted by AIMS to be the first time this has been observed. Figure 8-7 shows that the jewel anemone observed on the SPJs have extremely variable colours from white to pink and purple to red, orange, brown and yellow - light green and combinations of these (AIMS, 2022a). Different coloured colonies were observed to abut one another, but mix very little.

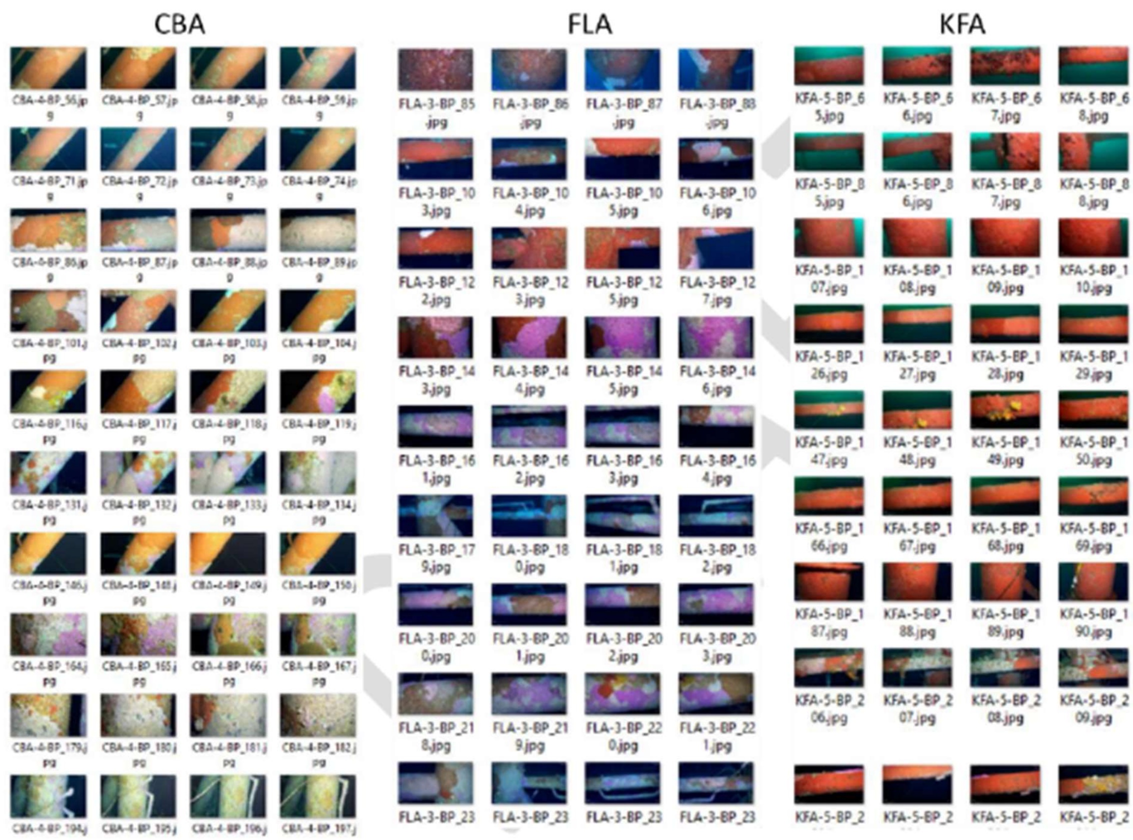


Figure 8-7 Colour variation in jewel anemone observed at Steel Piled Jackets

Figure 8-8 Example of yellow jewel anemone observed at Cobia

Figure 8-9 Example of pink and white jewel anemone observed at Flounder

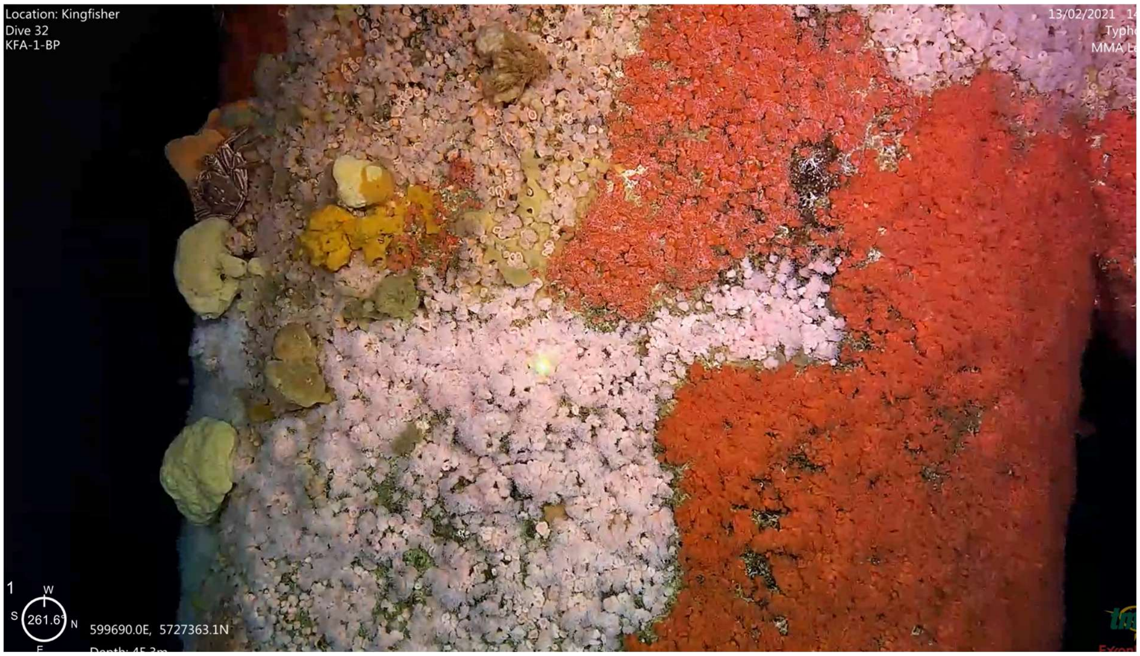


Figure 8-10 Example of pink and orange-red jewel anemone observed at Kingfish A

Jewel anemones are not known from any other offshore reef environments in this region, with reports of its occurrence typically associated with inshore rocky reefs (AIMS, 2022a) and other artificial structures such as mussel farms (AIMS, 2022a) and jetties. There was low coverage of jewel anemones in the benthic surrounds immediately adjacent to SPJs (1-12 percent).

8.4.2.3 Sponges

After jewel anemones, sponges were the dominant benthic biota observed on the SPJs, particularly at the bases where they were most dense and spanned a range of morphologies (AIMS, 2022a). Sponges replaced jewel anemone as the dominant benthic group from the seabed to 10 metres above the seabed as can be seen in Figure 8-11.

Assigning individual sponges observed on the SPJs to species groups was problematic due to the lack of available photographs of sponge species in the marine environment in temperate southern Australian marine environments. Hence a detailed assessment of the uniqueness of the sponges observed on the SPJs compared to those observed at South East Reef and reference sites is difficult to undertake. There were some sponges observed on the SPJs (including *Dactylia* sp. indet. and *Callyspongiidae* sp. indet) that appear very similar to commonly found species in temperate Australian waters. Given the number of what appear to be morphologically distinct sponges observed growing on the SPJ structures, these SPJ sponge gardens may contain a different assemblage of sponges compared to natural habitats (AIMS, 2022a).

A greater number of sponge morphologies/groups were observed with an increase in depth. The simpler (i.e., encrusting) sponge morphologies mostly found in shallower sections of the SPJs may be attributable to a stronger turbulent flow regime, whereas there were a larger number of complex shapes (i.e. upright forms) of sponges with increased depth on SPJs, potentially indicative of reduced flow strength at greater depths. This may indicate that the SPJs are providing an artificial habitat which is spanning the water column, and subsequently supporting a diversity of functionally distinct sponge assemblages including crusts, massive, and erect forms (AIMS, 2022a).

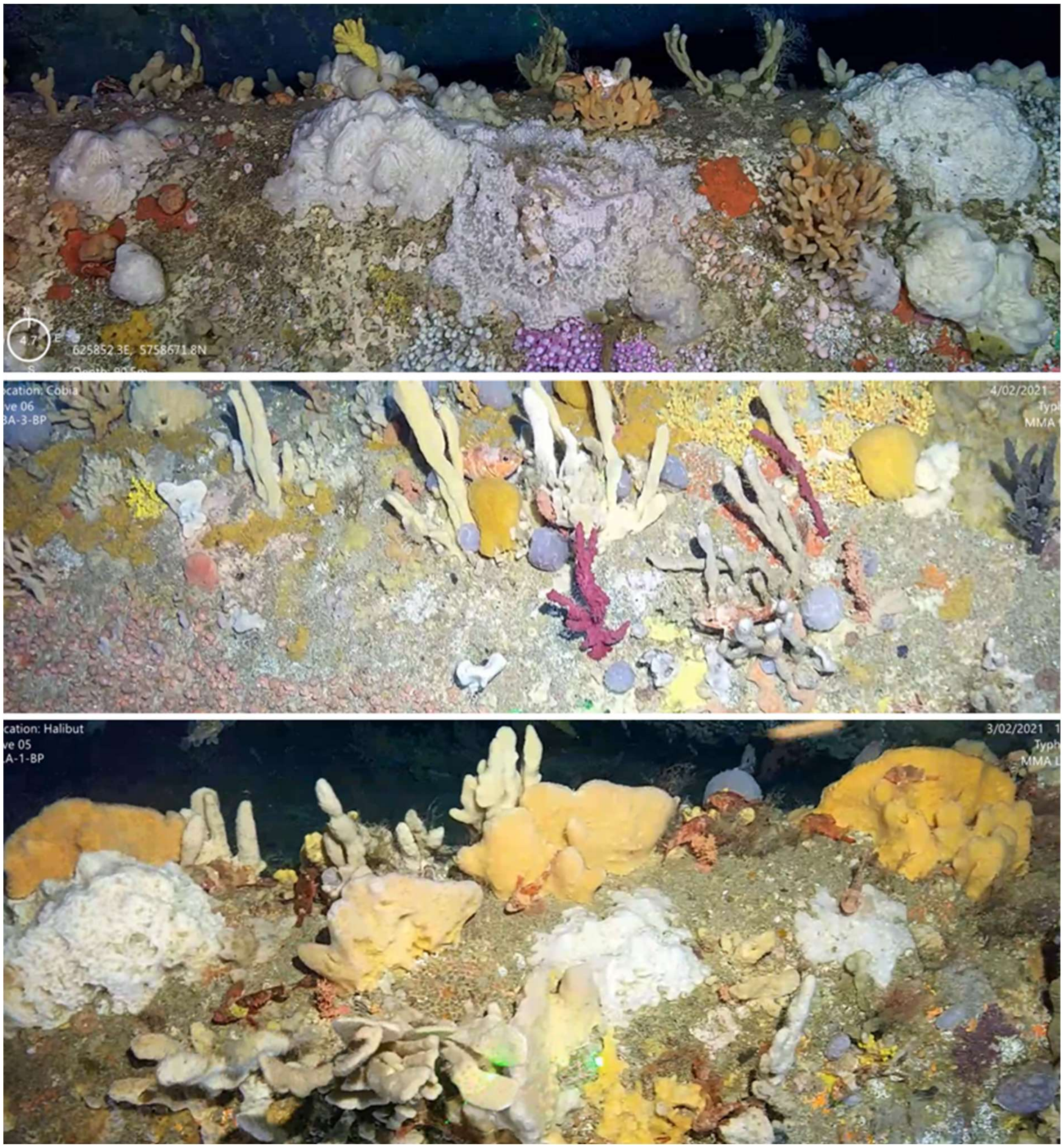


Figure 8-11 Sponges at Flounder at 90.5 metres depth (top), at Cobia at 740.8 metres depth (middle) and at Halibut at 70.0 metres depth (bottom)

8.4.2.4 Other benthic fauna

Mobile invertebrate species observed on or around the benthic surroundings of the SPJs during Environmental Survey 1 (Summer) included four ctenophores, five echinoderms, five molluscs (squid and octopuses) and ten pyrosomes. Crustaceans including 123 crabs and 14 southern rock lobsters (*Jasus edwardsii*) were the most dominant mobile invertebrates observed on the SPJs (AIMS, 2022a). Southern rock lobsters were observed on the lower sections of KFB, WKF, CBA, HLA and KFA (AIMS, 2022a) (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b).

The red rock crab (*Guinusia chabrus*) was observed to be particularly abundant throughout the water depths on the SPJs to depths deeper than approximately 60 metres (Figure 8-12) (AIMS, 2022a). This was reported to be the first known report of this species so far from shore and in depths beyond 50 metres. It is likely that the SPJs are providing structure and habitat for these invertebrate groups (AIMS, 2022a).

Figure 8-12 Red rock crabs and jewel anemones on Flounder at 59.2 metres depth

Other crab species identified during the review of historic ROV imagery (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b) included:

- crabs of the infraorder Brachyura at BMA, MKA, KFB and WKF
- swimmer crabs (family Portunidae) observed on the legs, braces and frames of some SPJs
- smaller crustaceans, including shore crabs in the family Grapsidae, observed in water depths <15 metres including WKF and KFB
- hermit crabs (family Diogenidae) observed in depths greater than 60 metres around WKF
- mottled shore crabs (*Cyclograpsus* spp.), observed in mid depths (15-60 metres) around KFB.

At KFB in 15-30 metres water depth, the high abundance of invertebrates observed was accounted for by large schools of krill (*Nyctiphanes australis*), which was unique to this SPJ, when compared to WKF (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b). Krill is an important component of many higher predator's diet. Both of these SPJs were producing at the time of these observations (KFB ceased production in 2019 and WKF is still producing at the time of writing of this EP). No krill was observed during Environmental Survey 1 (Summer) at any SPJs (producing or non-producing).

Jellyfish were also seen in the water column around the SPJs (AIMS, 2022a) (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b), while shrimps of the family Palaemonidae were also occasionally documented around the SPJs, including WKF (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b). The firebrick starfish (*Asterodiscides truncatus*) and long-spined sea urchin (*Centrostephanus rodgersii*) were also documented in depths greater than 60 metres around the base of KFB (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b).

Example images of benthic biota observed on the SPJs and surrounds are included in Figure 8-13 to Figure 8-33. An example of benthic cover observed at the South East Reef and reference sites is included in Figure 8-31. The green laser that can be seen in some of these images is present as a result of the ROV positioning.

Figure 8-13 Jewel anemone and red rock crabs on Flounder at 54.5 metres depth

Figure 8-14 Benthic biota on Flounder at 90.1 metres depth

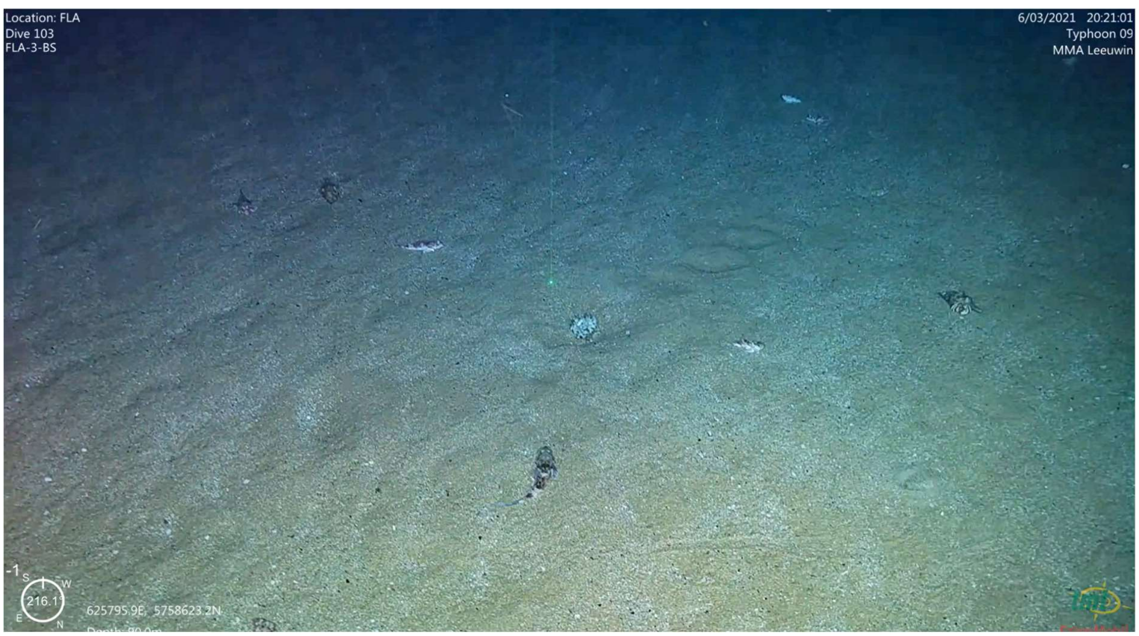


Figure 8-15 Benthic surrounds around Flounder at 90.0 metres depth

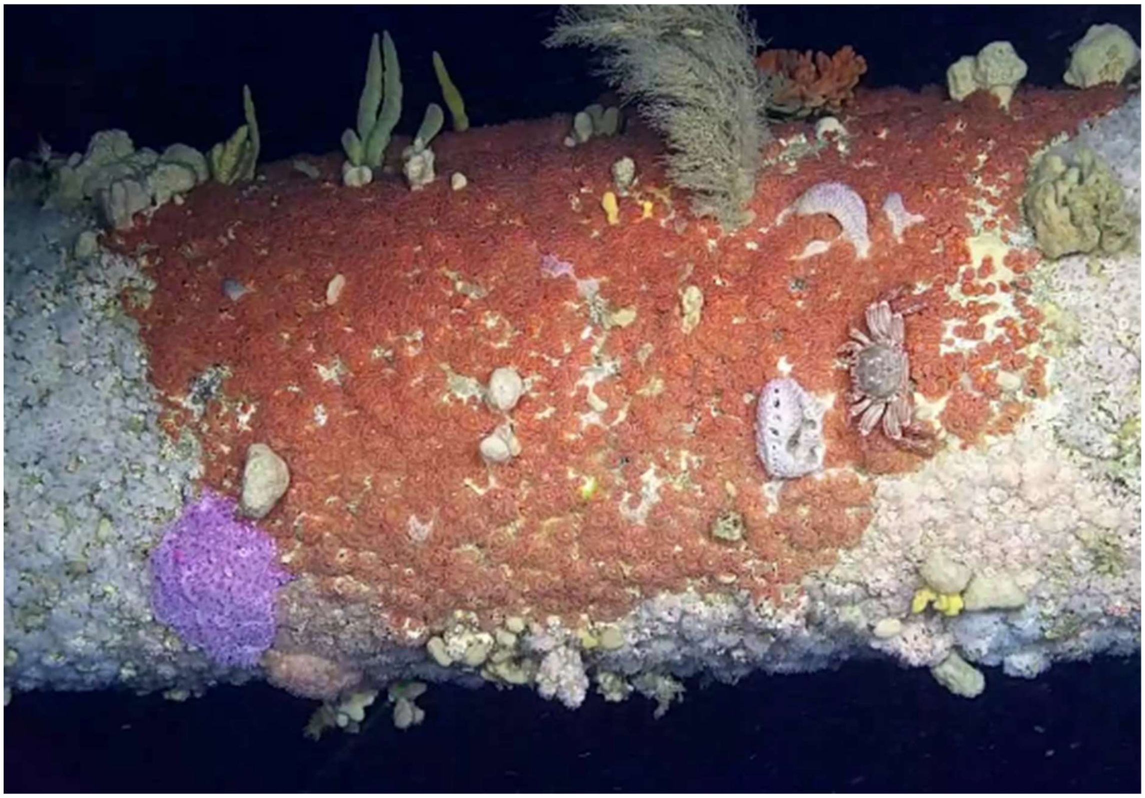


Figure 8-16 Benthic biota and red rock crab on Kingfish A at 61.9 metres depth

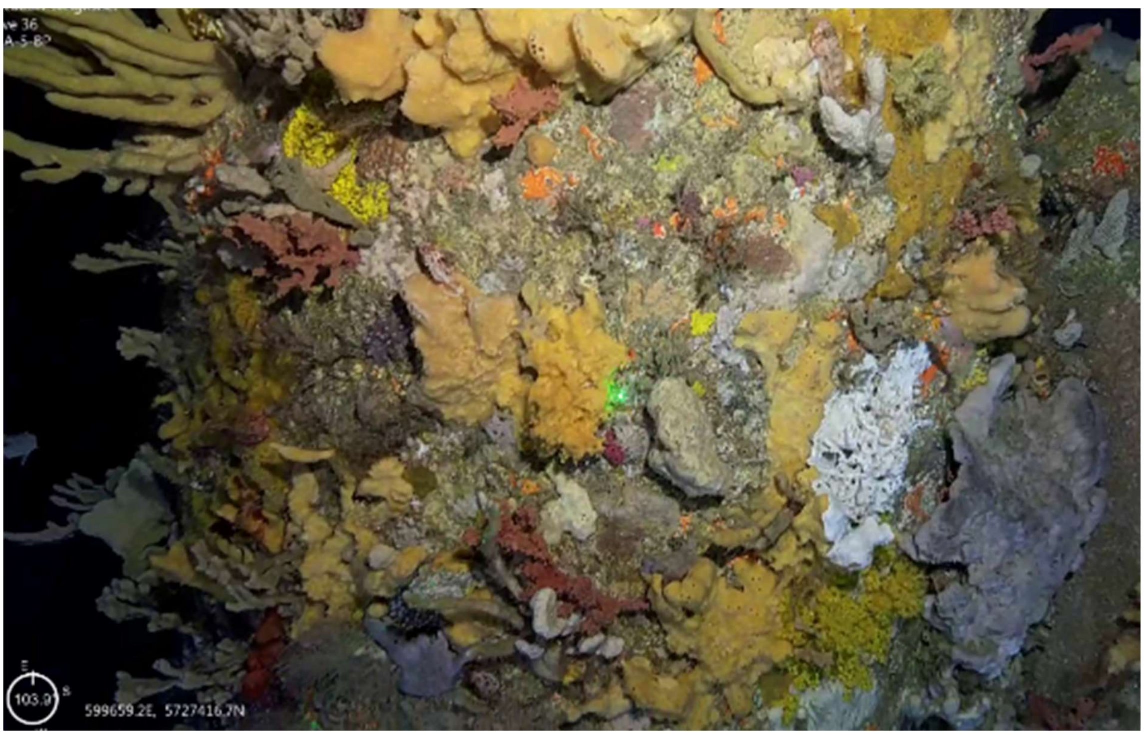


Figure 8-17 Benthic biota on Kingfish A at 74.5 metres depth

Figure 8-18 Benthic surrounds around Kingfish A at 73.9 metres depth

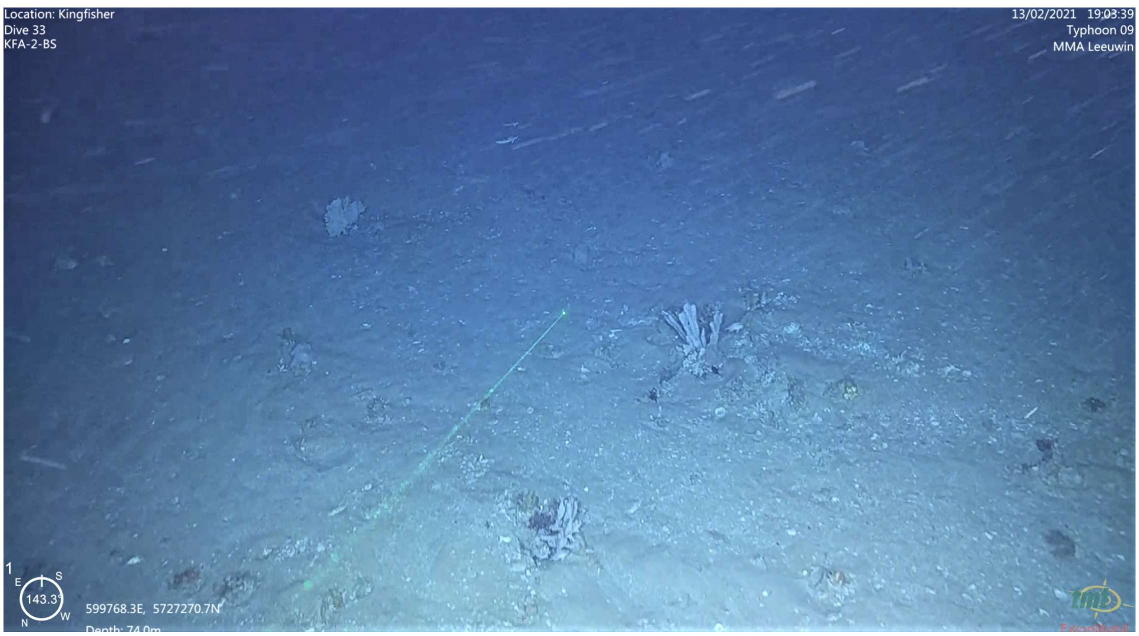


Figure 8-19 Benthic surrounds around Kingfish A at 74.0 metres depth

Figure 8-20 Benthic biota on Cobia at 58.0 metres depth

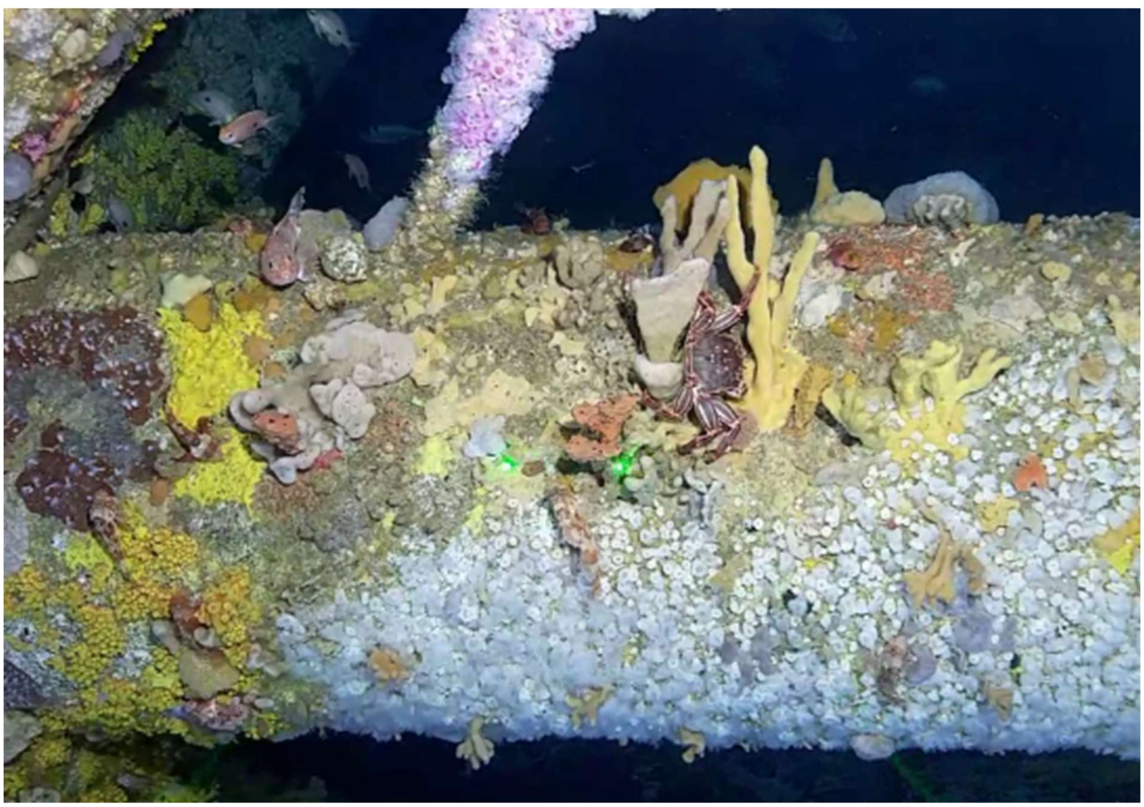


Figure 8-21 Benthic biota and red rock crab on Cobia at 74.7 metres depth

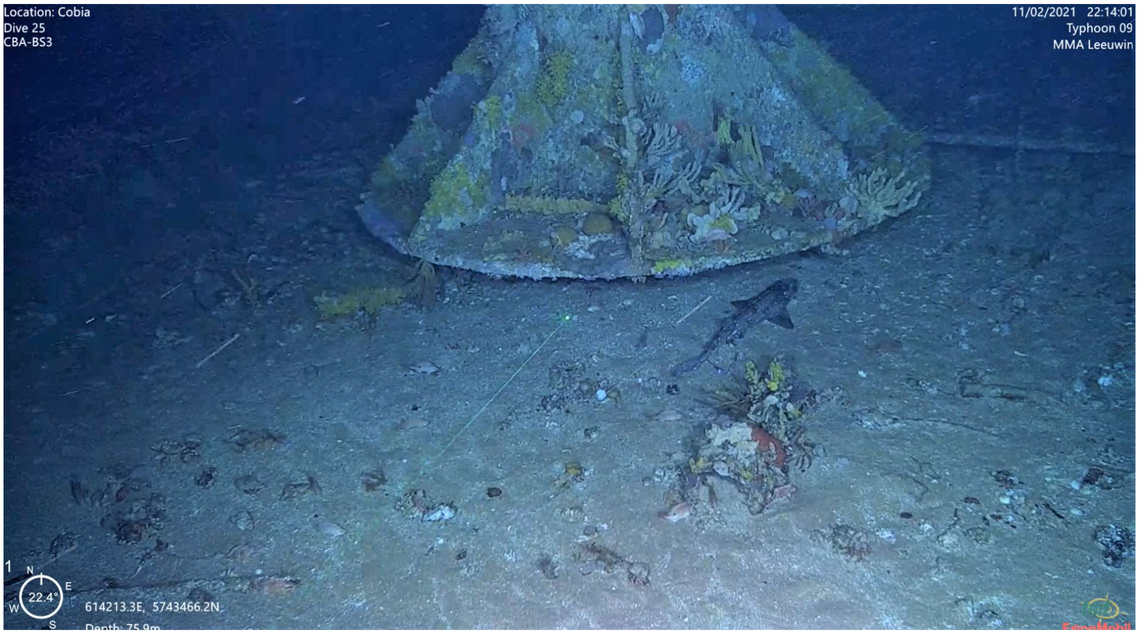


Figure 8-22 Benthic surrounds around Cobia at 75.9 metres depth

Figure 8-23 Benthic surrounds around Cobia at 76.0 metres depth

Figure 8-24 Benthic biota on Halibut at 58.2 metres depth

Figure 8-25 Benthic biota on Halibut at 69.8 metres depth

Figure 8-26 Benthic surrounds around Halibut at 69.3 metres depth

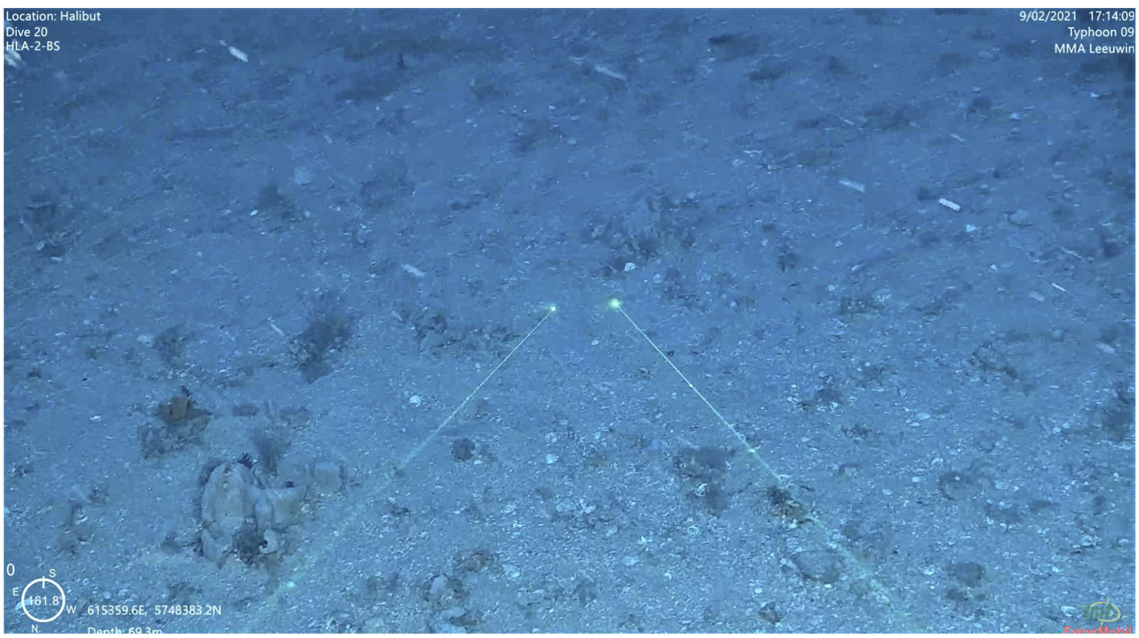


Figure 8-27 Benthic surrounds around Halibut at 69.3 metres depth

Figure 8-28 Benthic biota on Whiting at 50 metres depth showing sponges, jewel anemones and an egg casing of a draughtboard shark

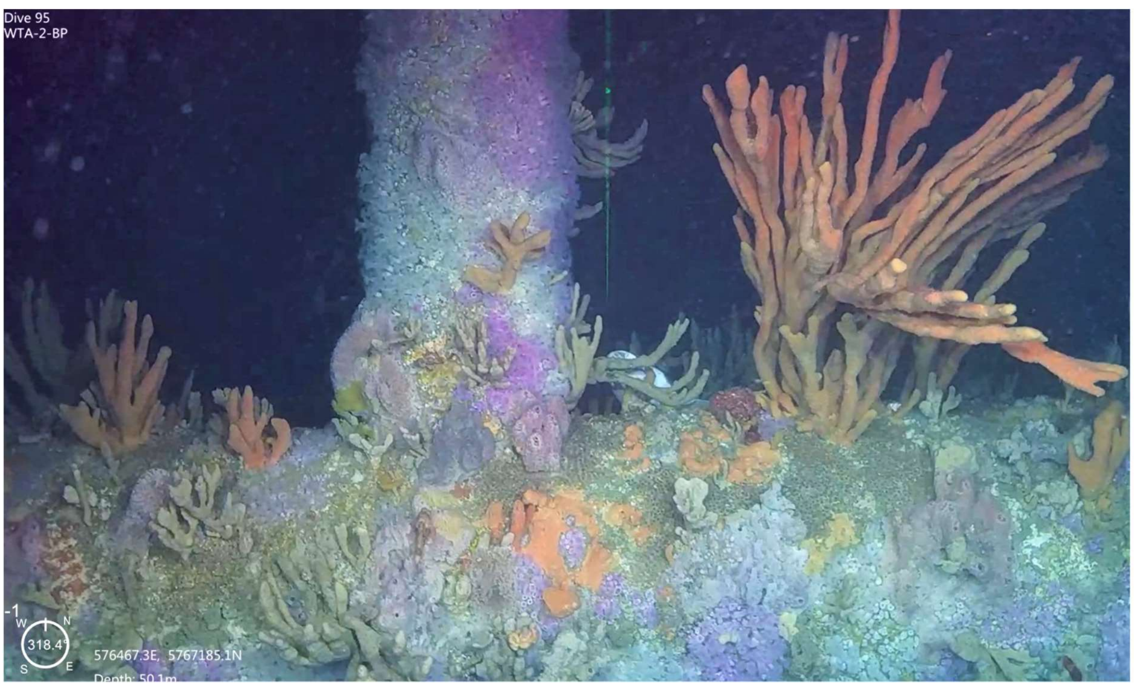


Figure 8-29 Benthic biota on Whiting at 50 metres depth showing sponges and jewel anemones

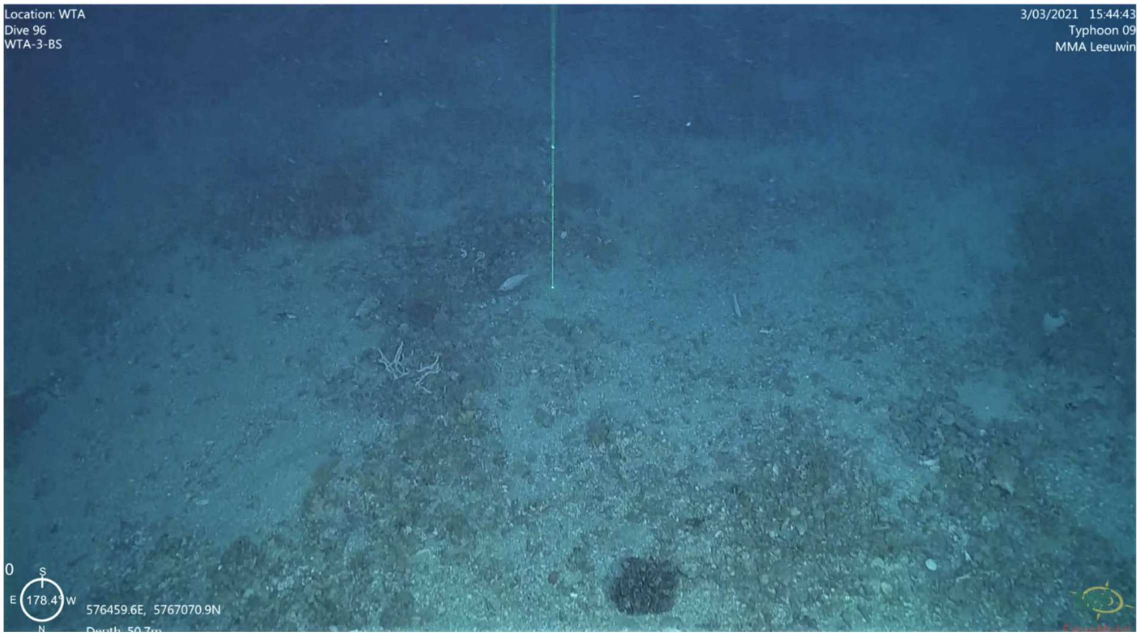


Figure 8-30 Benthic surrounds around Whiting at 50.7 metres depth

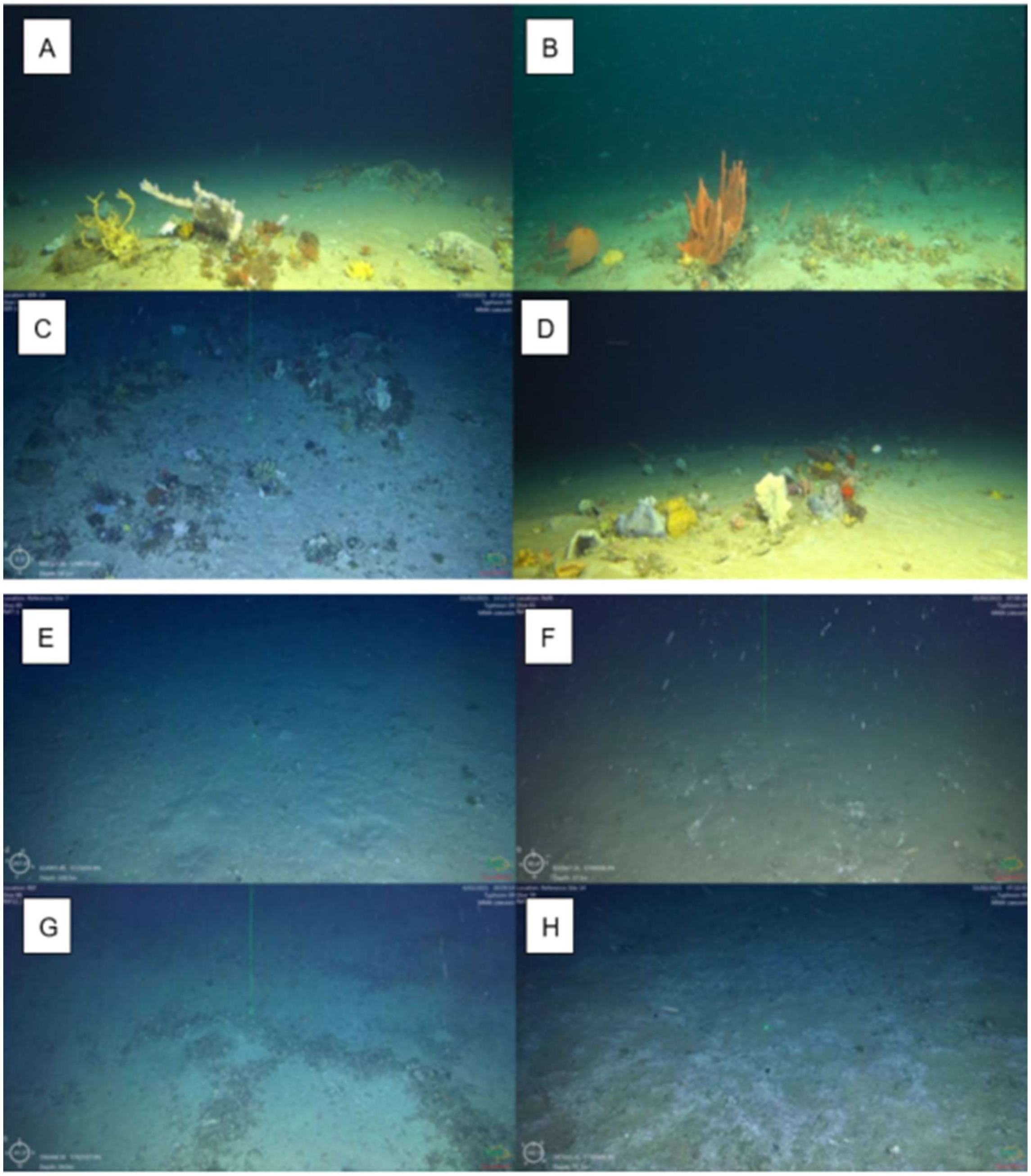


Figure 8-31 Benthic communities and sandy substrate at South East Reef (Panels A – D) and at reference sites (Panels E-H)

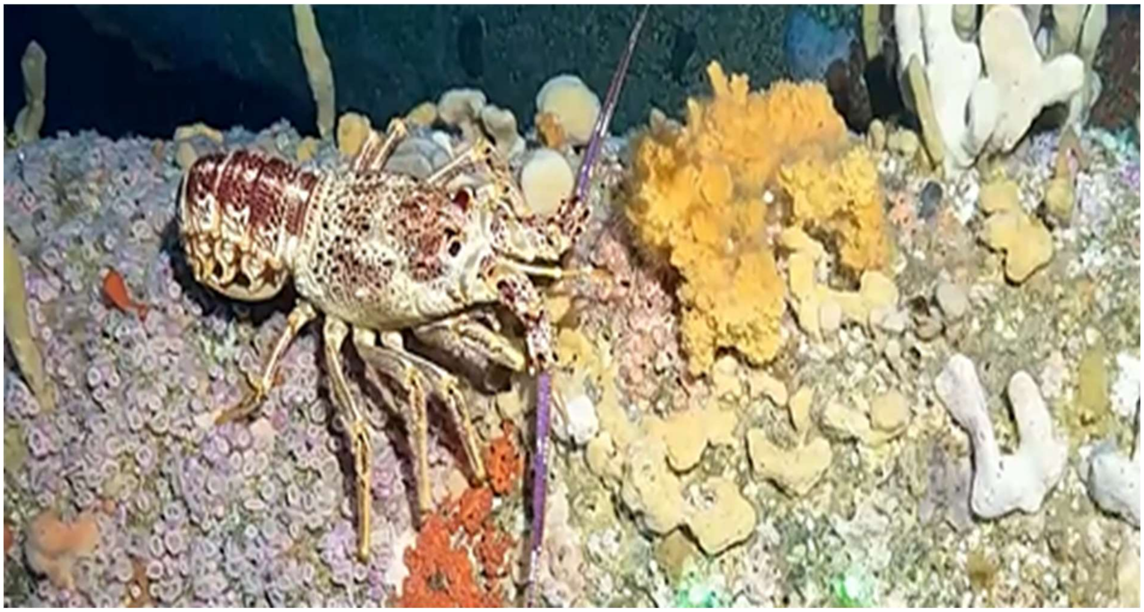


Figure 8-32 Southern rock lobster on Halibut at 57.6 metres depth

Figure 8-33 Maori octopus at Flounder at 90 metres depth

Comparing the benthic biota observed at non-producing SPJs (WTA, KFA and FLA) with those observed at the SPJs still producing (CBA and HLA) may provide an indication of any potential differences on these metrics as a result of aspects of ongoing production operations such as discharges (e.g. macerated food waste, sewage, produced formation water), heat, light and noise which may have the potential to impact the types and abundance of marine biota in the vicinity of the SPJs. Direct comparison of observations at SPJs in different life cycle stages is difficult due to confounding factors such as water depth, location and ongoing activities at SPJs that have ceased production, but are subject to ongoing activities on the SPJ such as well P&A and maintenance, which result in some ongoing operational discharges. Despite this, studying the observations made at WTA (which ceased production in 1997) and the other SPJs surveyed in Environmental Survey 1 (Summer) does not indicate significant differences in the types or abundance of benthic biota observed.

8.4.2.5 Depth-related patterns in benthic communities

Observed benthic communities vary with depth and these differences warrant consideration and understanding in assessing the environmental benefit of retaining structural height above the seabed or understanding environmental impacts from the removal of the SPJs.

8.4.2.5.1 Cobia

CBA is still producing at the time of writing of this EP.

The percent cover of benthic communities observed on CBA at different depth intervals is shown in Figure 8-34. Example imagery from Environmental survey 1 (Summer) is shown in Figure 8-35. In summary, Cnidaria, primarily jewel anemone, was the dominant biota growing on CBA at all depths but declined in cover from more than 96 percent in depths less than 68 metres to 74 percent towards the seabed (68-78 metres). No macroalgae was observed on CBA. In depths less than 26 metres, CBA was almost entirely covered in jewel anemone (99.8 percent).

Beyond 55 metres depth, the percent cover of a variety of sponge taxa and morphologies increased to a total of 22 percent at the seabed region. The most dominant sponge form was ‘encrusting’. No differences existed in the percent cover of jewel anemone or sponges across faces (east, west, north, south), nor for sponges beam orientation (vertical, diagonal, horizontal). However, the percent cover of jewel anemone was lower on vertical beams compared to horizontal beams on this SPJ (AIMS, 2022a).

Biota cover on CBA was consistently very high at more than 75 percent cover across all depths (Figure 8-34). Biota height was low in depths less than 68 metres but medium in depths of 66-78 metres. The changes in height scores for the 68-78 metres section of CBA reflects the presence of erect forms of sponges in this section of the SPJ (AIMS, 2022a).

Sponges, biota height and substrate percent cover were all positively correlated with the deep sections of CBA. A total of 22 crabs were observed on CBA, 16 of these in depths less than 55 metres, and five southern rock lobsters (*Jasus edwardsii*) all in depths greater than 55 metres (AIMS, 2022a).

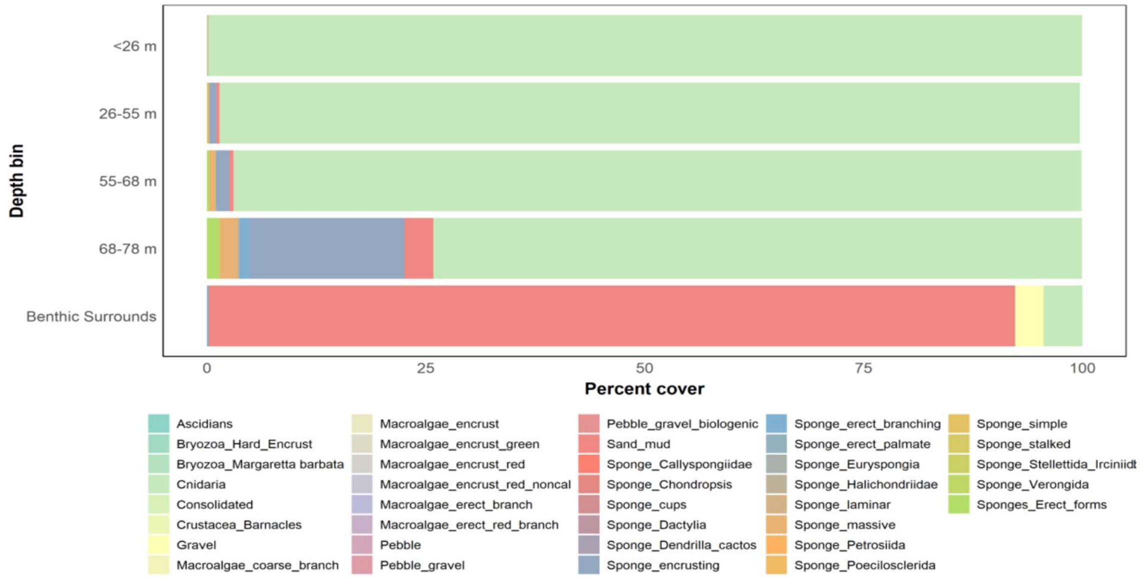


Figure 8-34 Percent cover of benthic communities observed on Cobia with increasing depth

Figure 8-35 Flora and fauna observed at Cobia at 74.5 metres water depth (top) in comparison to the Cobia benthic surrounds at 75.2 metres water depth (bottom)

8.4.2.5.2 Flounder

FLA ceased production in 2020.

The percent cover of benthic communities observed on FLA at different depth intervals is shown in Figure 8-36. Example imagery from Environmental survey 1 (Summer) is shown in Figure 8-37. In summary, Cnidaria, primarily jewel anemone, was the dominant biota growing on FLA in depths <93 metres with 99 percent cover in 0-38 metres, 99 percent in 38-55 metres, 96 percent in 55-83 metres and 67 percent in 83-93 metres.

The percent cover of both jewel anemone and sponges varied across depths on FLA (Figure 8-36). For jewel anemone, this was due a decline in percent cover beyond 55 metres. Sponges were present with a higher percent cover in 83-93 metres (20 percent cover) than in depths shallower than 55 metres. Depths of 83-93 metres had the largest number of different sponge morphologies/groups with seven types, predominately encrusting and massive forms with 10 percent and 7 percent cover, respectively. No differences existed in the percent cover of jewel anemone or sponges across faces (east, west, north, south) or according to beam orientation (vertical, diagonal, horizontal) (AIMS, 2022a).

Biota cover on FLA was consistently very high at more than 75 percent cover across all depths (Figure 8-36). Biota height on FLA was low in depths less than 83 metres but medium in 83-93 metres depth reflecting the presence of erect sponges in this section of the SPJ (AIMS, 2022a).

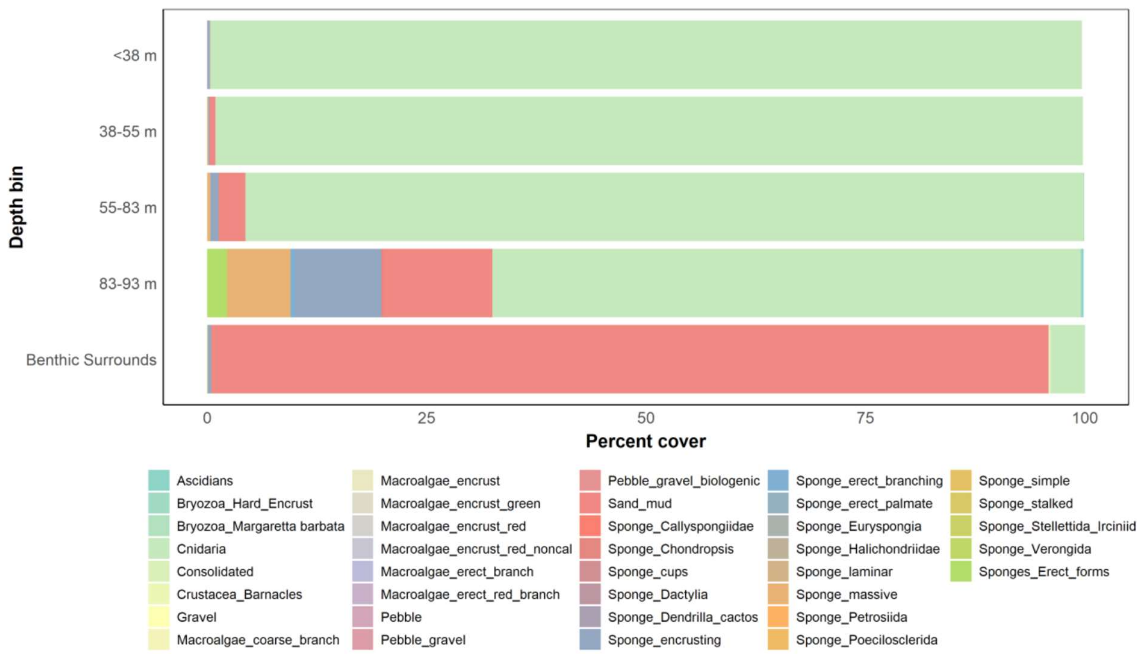


Figure 8-36 Percent cover of benthic communities observed on Flounder with increasing depth

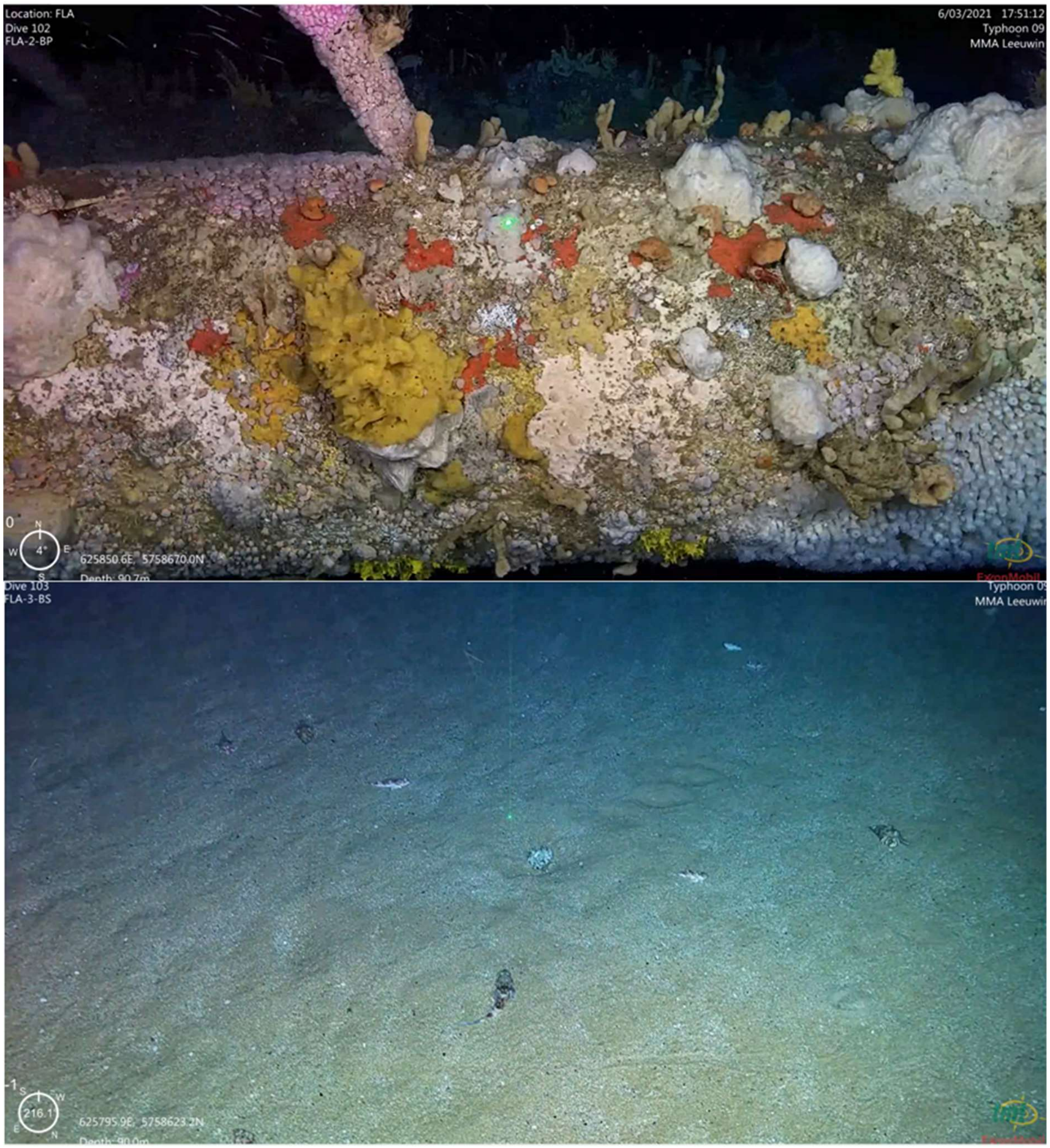


Figure 8-37 Flora and fauna observed at Flounder at 90.7 metres water depth (top) in comparison to the Flounder benthic surrounds at 90.0 metres water depth (bottom)

8.4.2.5.3 Halibut

HLA is still producing at the time of writing this EP.

The percent cover of benthic communities observed on HLA at different depth intervals is shown in Figure 8-38. Example imagery from Environmental survey 1 (Summer) is shown in

Figure 8-39. In summary, Cnidaria, primarily jewel anemone, was the most dominant biota growing on HLA in depths <73 metres with 99 percent cover in 0-26 metres, 98 percent in 26-55 metres, 88 percent in 55-63 metres, and 55 percent in 63-73 metres (Figure 8-38). The percent cover of both jewel anemone and sponges varied across depths on HLA (Figure 8-38). For jewel anemone, this was due to a decline in percent cover beyond 55 metres. Patterns were similar, but reversed, for the percent cover of jewel anemone and sponges. Sponges were present in higher percent cover and jewel anemone in lower percent cover in 55-63 metres and 63-73 metres than all other depth ranges but similar between these two depths at the base of HLA (AIMS, 2022a).

Sponges increased in percent cover with depth with <1 percent cover in 0-26 metres, 2 percent in 26-55 metres, 11 percent in 55-63 metres, and 36 percent in 63-73 metres. There was also an increase in the number of different sponge groups/morphologies with depth, consisting of five different types found in 0-26 metres, seven in 26-55 metres, ten in 53-63 metres and ten in 63-73 metres (AIMS, 2022a).

No differences existed in the percent cover of jewel anemone or sponges across faces (east, west, north, south) or according to beam orientation (vertical, diagonal, horizontal) (AIMS, 2022a).

Biota cover on HLA was consistently very high at >75 percent cover across all depths <73 metres. Biota height was low in depths <63 metres but medium in depths 63-73 metres (Figure 8-38) reflecting the presence of erect forms of sponges in this section of the SPJ.

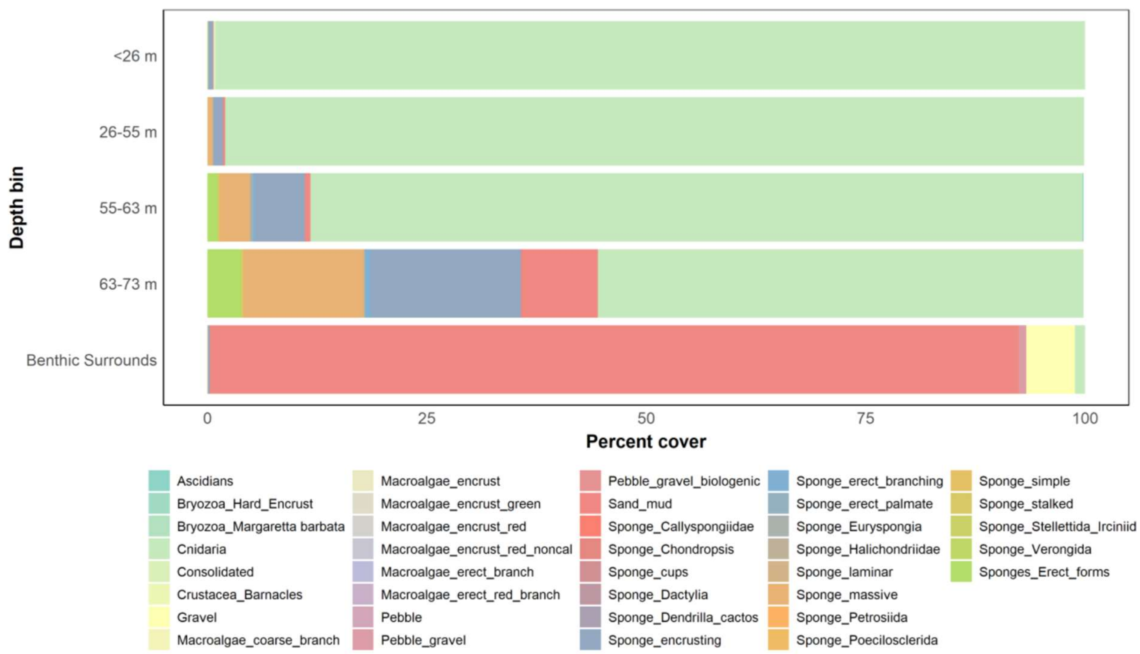


Figure 8-38 Percent cover of benthic communities observed on Halibut with increasing depth

Figure 8-39 Flora and fauna observed at Halibut at 69.5 metres water depth (top) in comparison to the Halibut benthic surrounds at 69.3 metres water depth (bottom)

8.4.2.5.4 Whiting

WTA ceased production in 1997.

The percent cover of benthic communities observed on WTA at different depth intervals is shown in Figure 8-40. Example imagery from Environmental survey 1 (Summer) is shown in Figure 8-39. In summary, Cnidaria, primarily jewel anemone, was the dominant biota on WTA in depths <54 metres with 99 percent cover in 0-26 metres, 91 percent in 26-44 metres and dropping to 64 percent in 44-55 metres. In general, the percentage cover of sponges increased with depth, consisting of <1 percent in 0-26 metres, 9 percent in 26-44 metres and 34 percent in 44-54 metres. This change in percent cover of both jewel anemone and sponges across depths on WTA were significant (AIMS, 2022a).

The percent cover of jewel anemone was lower in the 44-55 metres depth range compared to 0-26 metres and 26-44 metres depths (Figure 8-40). There was also an increase in the number of different sponge groups/morphologies at increased depths, consisting of two in 0-26 metres, four in 26-44 metres and eight in 44-54 metres (AIMS, 2022a).

No differences existed in the percent cover of jewel anemone or sponges across faces (east, west, north, south) or according to beam orientation (vertical, diagonal, horizontal) on WTA.

Biota cover of WTA was consistently very high at more than 75 percent across all depths (Figure 8-40). Biota height was low on WTA in depths <44 metres, but medium in depths 44-55 metres. The change in height scores for the 44-54 metres section of WTA reflects the presence of erect forms of sponges in this section of the SPJ (AIMS, 2022a).

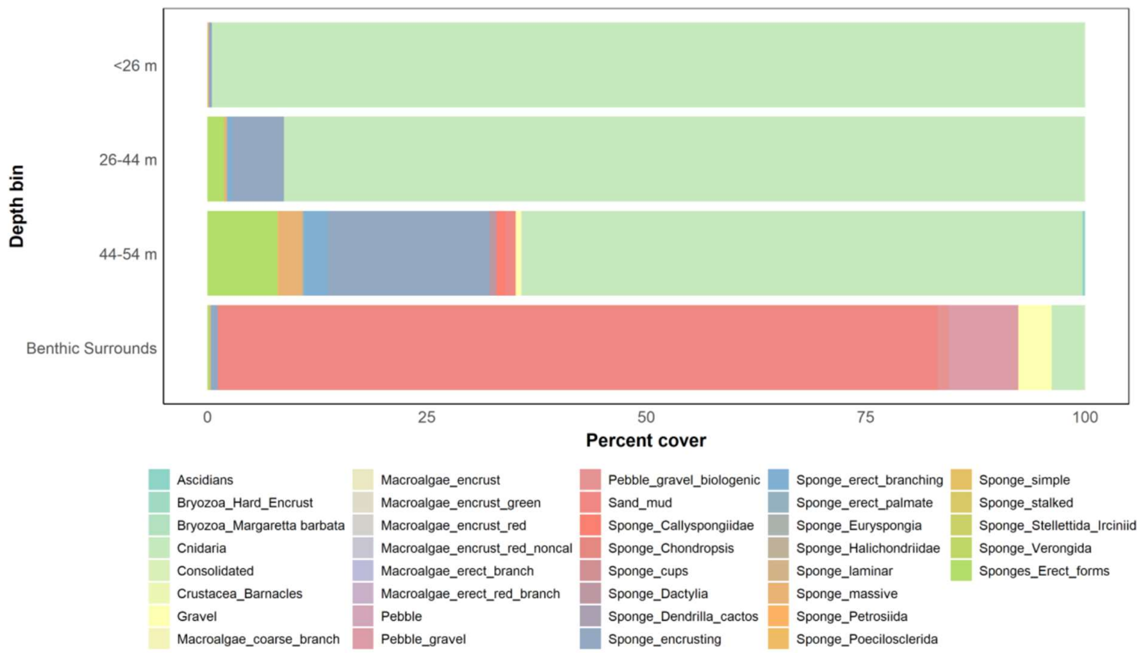


Figure 8-40 Percent cover of benthic communities observed on Whiting with increasing depth

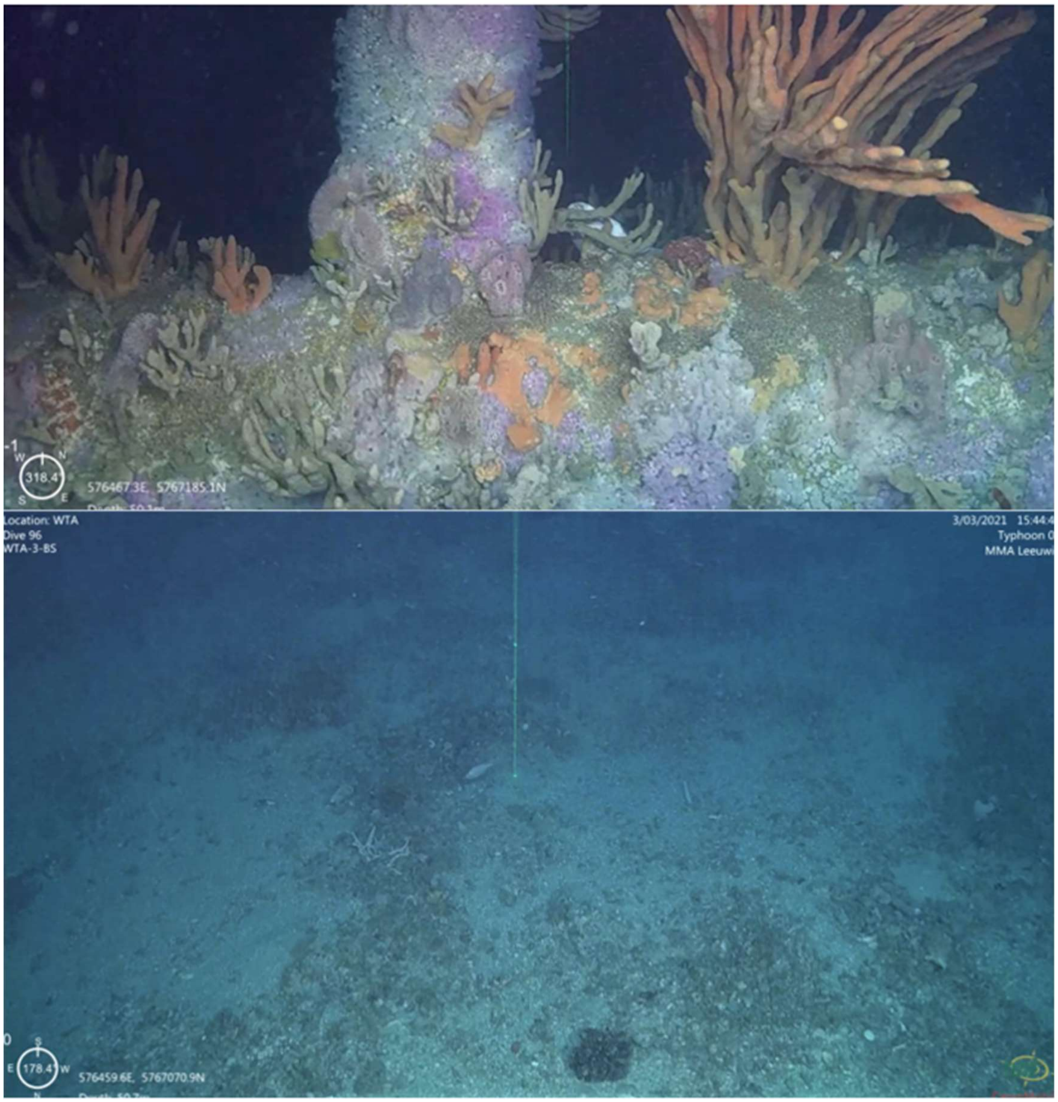


Figure 8-41 Flora and fauna observed at Whiting at 50.1 metres water depth (top) in comparison to the Whiting benthic surrounds at 50.7 metres water depth (bottom)

8.4.2.5.5 Kingfish A

KFA ceased production in 2015.

The percent cover of benthic communities observed on KFA at different depth intervals is shown in Figure 8-42. Example imagery from Environmental survey 1 (Summer) is shown in Figure 8-43. In summary, Cnidaria, primarily jewel anemone, was the dominant biota growing on KFA with 99 percent cover in 0-26 metres, 98 percent in 26-55 metres, 89 percent in 55-67 metres and 30 percent in 67-77 metres. In general, sponge cover increased with an increase in depth at <1 percent in 0-26 metres, 2 percent in 26-55 metres, 11 percent in 55-67 metres, and were the most dominant biota in 66-77 metres with 52 percent coverage. The percent cover of jewel anemone and sponges differed among all depth combinations with sponges increasing in percent cover with depth and jewel anemone declining (Figure 8-42).

In general, there was also a greater number of different sponge groups/morphologies with increasing depth, with three in 0-26 metres, seven in 26-55 metres, eight in 55-67 metres and nine in 67-77 metres (AIMS, 2022a).

Biota cover on KFA was consistently high at >75 percent cover across all depths. Biota height was low on KFA in depths <67 metres, but medium in depths of 67-77 metres. The change in height scores for this section of KFA reflects the presence of erect forms of sponges in this section of the SPJ. No differences existed in the percent cover of jewel anemone or sponges across faces (east, west, north, south) or according to beam orientation (vertical, diagonal, horizontal) on KFA (AIMS, 2022a),

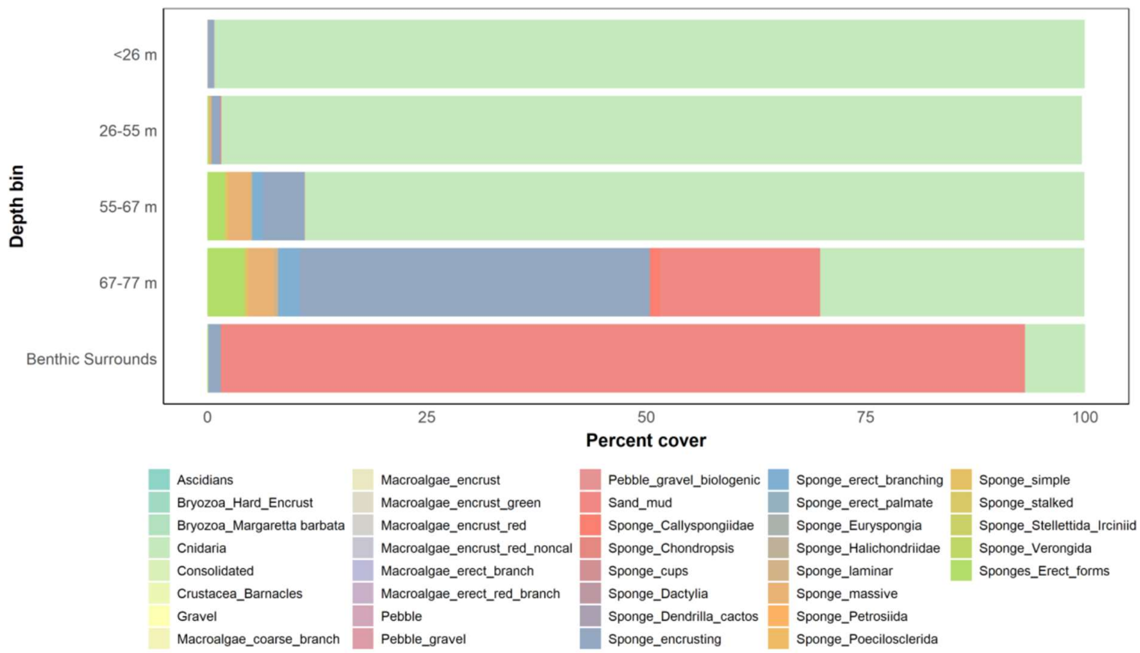


Figure 8-42 Percent cover of benthic communities observed on Kingfish A with increasing depth

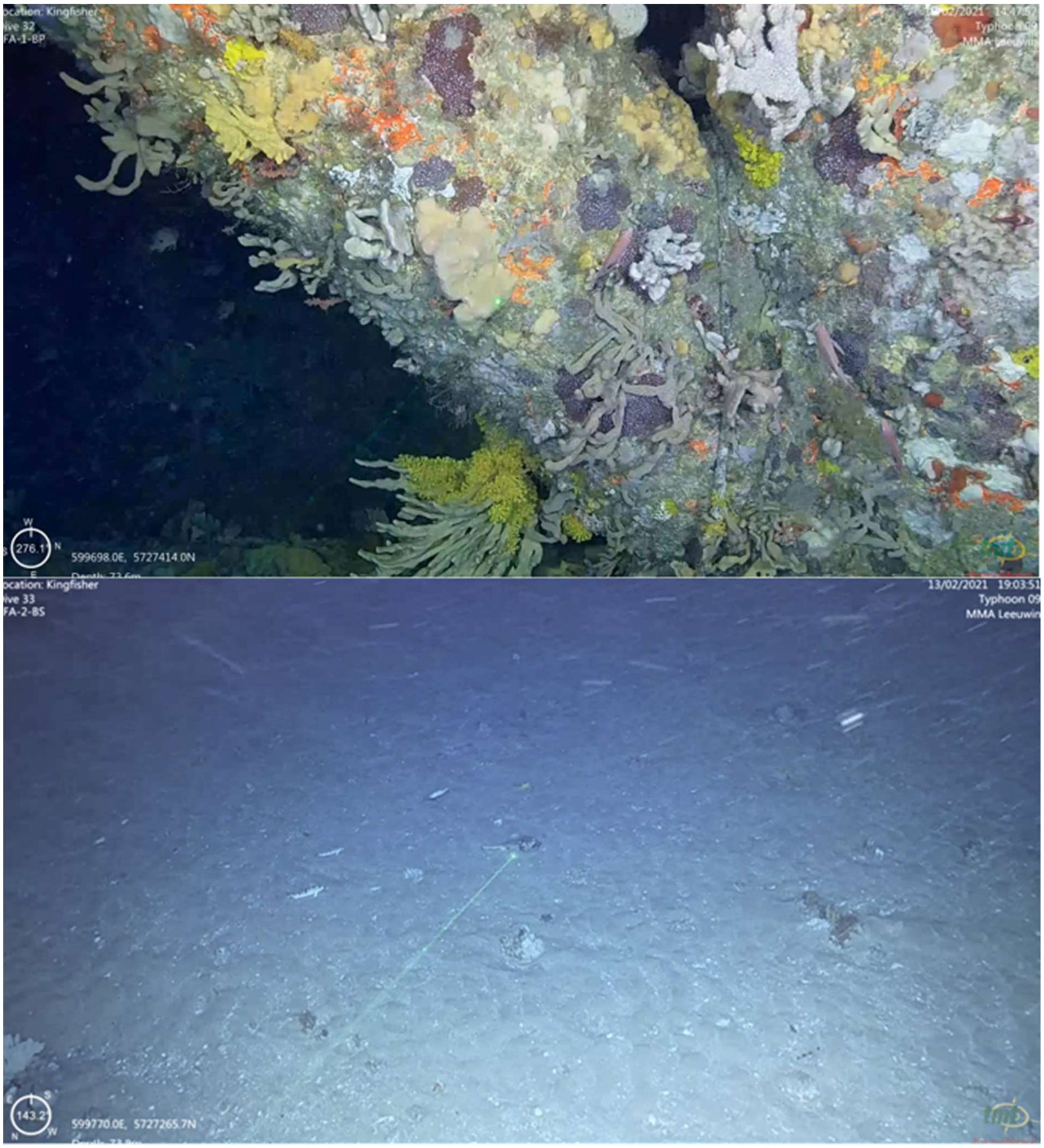


Figure 8-43 Flora and fauna observed at Kingfish A at 73.6 metres water depth (top) in comparison to the Kingfish A benthic surrounds at 73.9 metres water depth (bottom)

8.4.2.6 Benthic communities and seabed morphology in the immediate Steel Piled Jacket surrounds

8.4.2.6.1 Infauna

Sediment samples collected during Environmental Survey 1 (Summer) and analysed for infauna (species living in the sediments), identified Corophiidae (a family of amphipods), as the most common species at HLA, FTA, CBA, MKA, KFA, KFB, FLA, BMA, WTA and the reference sites, while *Tanaidacea* spp. and Ostracoda spp. were common at most sites surveyed (refer Section 5.5.3).

In terms of infauna species assemblages there was relatively limited variation across the sites. FLA was the only location with an assemblage that was discrete from the other SPJs and reference sites but was still dominated by similar species: amphipod crustaceans (*Phoxocephalidae, Platyischnopidae, Lysianassidae, Corophiidae, Oedicerotidae*) (AECOM Australia Pty Ltd, 2021).

The sample sites for infauna were coincident with those sampled for sediment chemistry and physical properties. Statistical analysis results showed that the relationship between sites based on species assemblages and relationships between sites based on sediment chemical (including contaminants) and physical parameters were not strongly linked. The overall conclusion of the infauna analysis was that species of infauna did not differ markedly between the SPJ and the reference sites sampled, and there was no clear impact on benthic infauna due to platform influences (AECOM Australia Pty Ltd, 2021).

8.4.2.6.2 Cobia benthic surrounds

Based on video analysis performed by AIMS, the seabed surrounding CBA was noted to be flat and dominated by course sandy sediment (92 percent) with minor areas of gravel (3 percent). Sparse patches of sessile invertebrates included Jewel anemone (4 percent) and some sparse erect sponges (<1 percent) (refer Figure 8-44 and Figure 8-45).

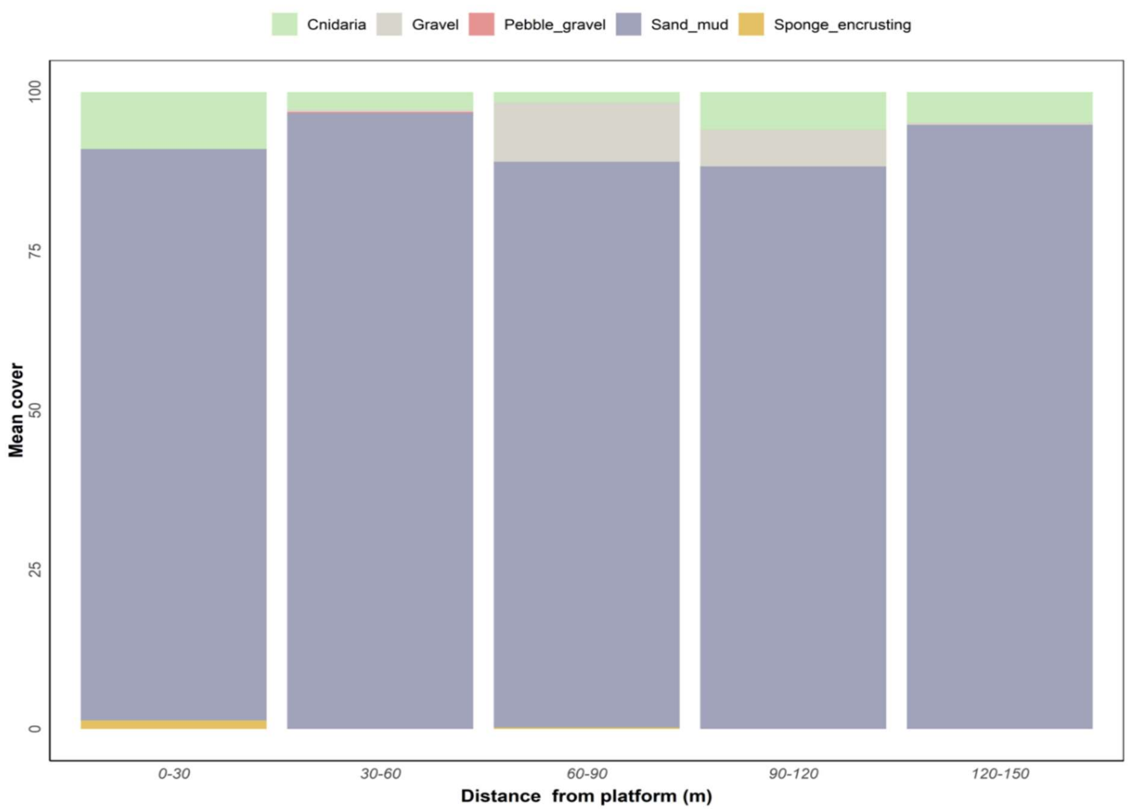


Figure 8-44 Average percent cover of living biota communities and substrate categories at Cobia

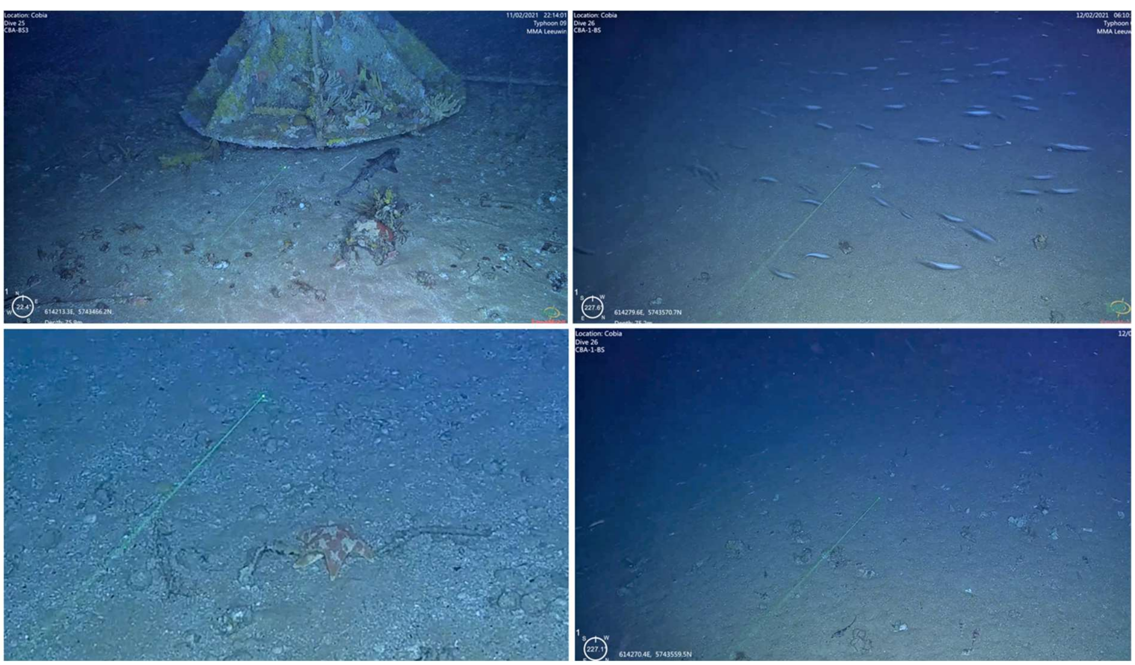


Figure 8-45 ROV images from Cobia benthic surrounds

8.4.2.6.3 Flounder benthic surrounds

The seabed surrounding FLA was mostly flat and sandy with some sparse benthic invertebrate cover (typically sponges). Biota cover (<1 percent) and height were low in the benthic surrounds of FLA. Sponges and Bryozoa were present in low cover (<1.5 percent) near the SPJ (0-30 metres and 30-60 metres) (Figure 8-46 and Figure 8-47). Sand/mud represented the majority of benthic cover (91-98 percent) at all distances, followed by jewel anemone (2-6 percent) and pebble/gravel (<1 percent), though the latter was not present very close to the SPJ (0-30 metres). Some minor (<1 percent) cover of gravel and consolidated benthic habitat were seen at 30-60 metres and 90-120 metres away from the SPJ (AIMS, 2022a).

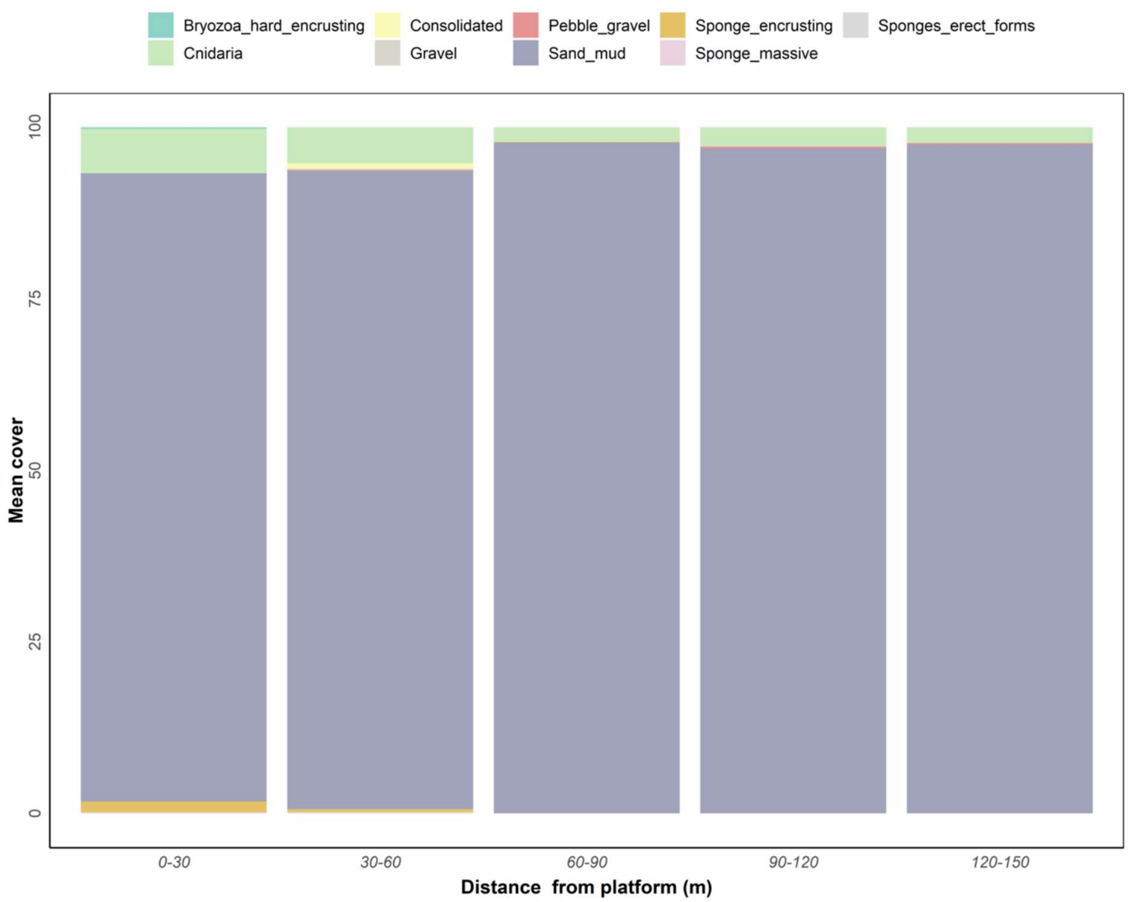


Figure 8-46 Average percent cover of living biota communities and substrate categories at Flounder

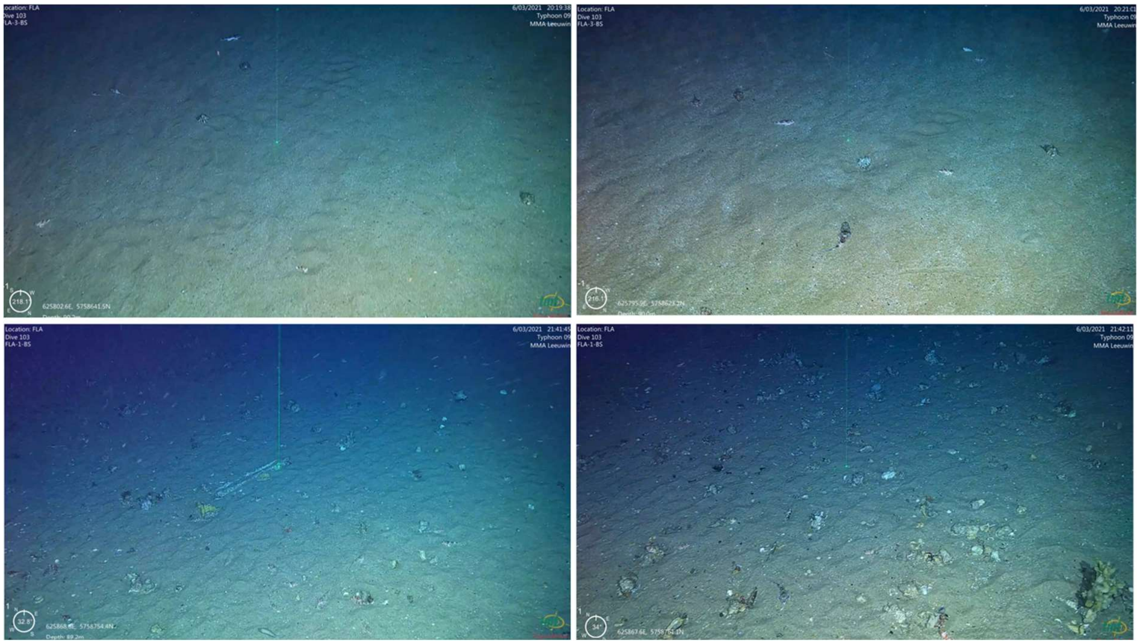


Figure 8-47 ROV images from Flounder benthic surrounds

8.4.2.6.4 Halibut benthic surrounds

The seabed was flat with medium grained sediments and shell grit. Some frequent patches of large shells were observed and the seabed appeared to be reef-like (AIMS, 2022a).

Biota cover and height was low in the benthic surrounds of HLA (Figure 8-48. Infrequent and low-cover patches of benthic invertebrates (sponges/filter feeds) were noted (Figure 8-49). Sand/mud were the dominant cover around the SPJ (86-97 percent) followed by gravel (<1-11 percent) and jewel anemone (<1-2 percent). Encrusting, erect, and laminar forms of sponges were observed in low percent cover (>1 percent) at all increasing distances from the SPJ (AIMS, 2022a).

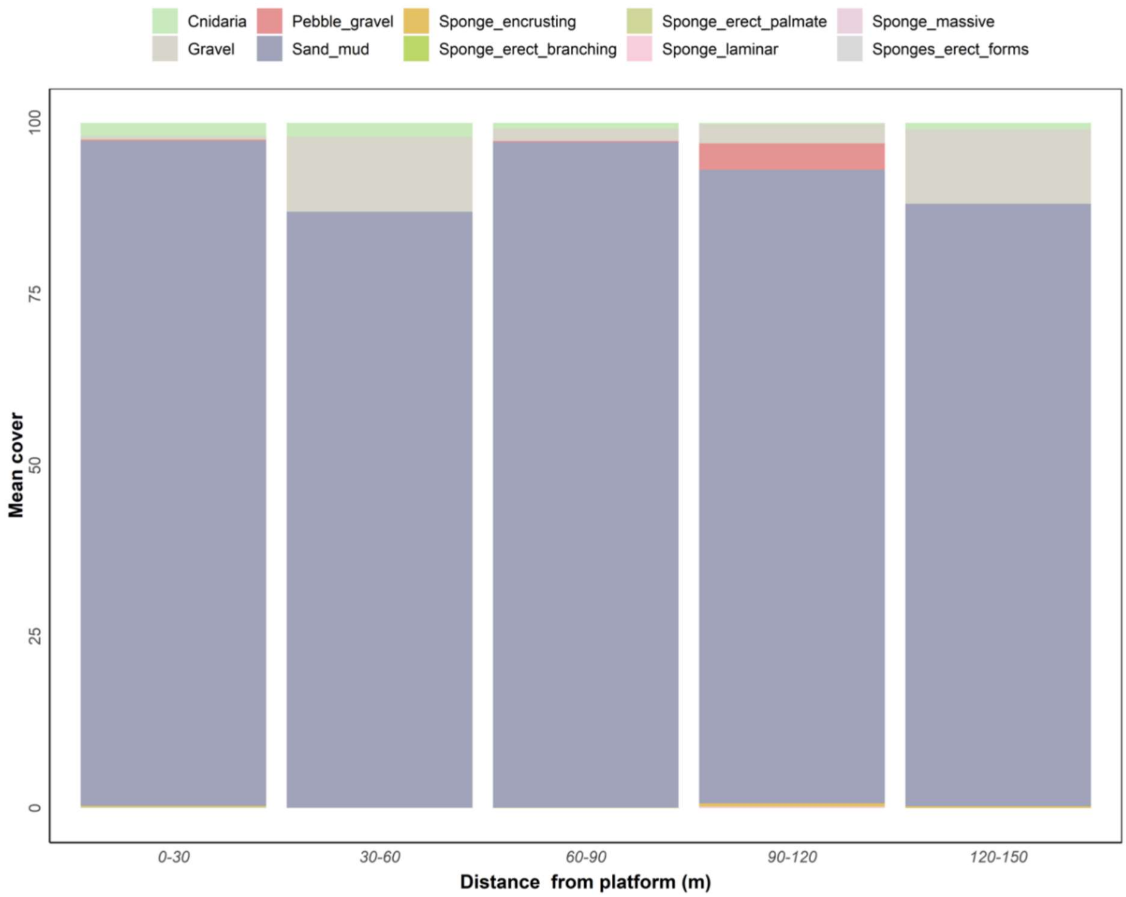

Cnidaria
Gravel
Pebble_gravel
Sand_mud
Sponge_encrusting
Sponge_erect_branching
Sponge_erect_palmate
Sponge_laminar
Sponge_massive
Sponges_erect_forms
Mean cover
0
25
50
75
100
0-30
30-60
60-90
90-120
120-150
Distance from platform (m)

Figure 8-48 Average percent cover of living biota communities and substrate categories at Halibut

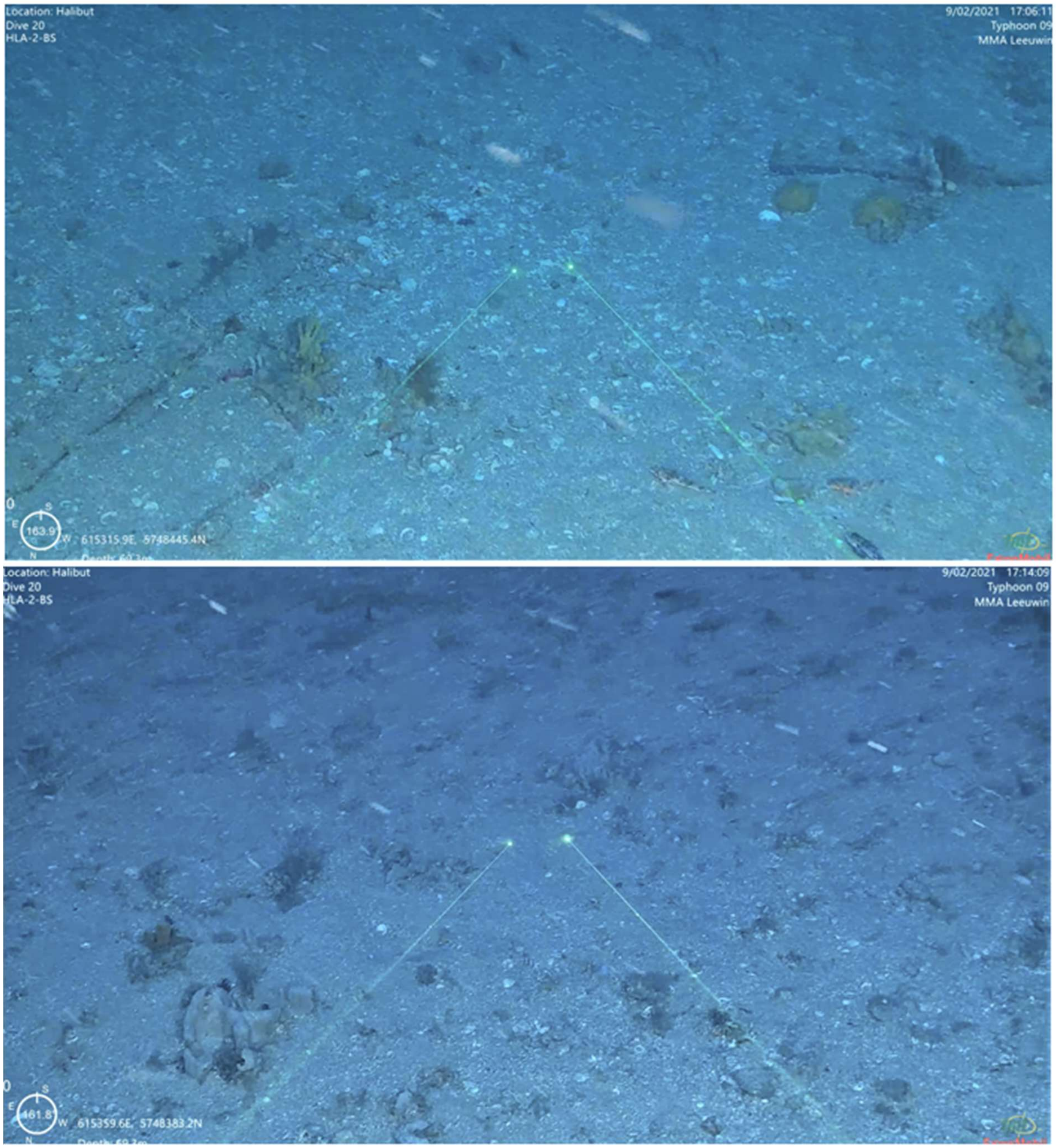


Figure 8-49 ROV images from Halibut benthic surrounds

8.4.2.6.5 Whiting benthic surrounds

The seabed surrounding WTA was flat and predominantly sandy with some rubbly sections. Very few sponges were present except for where a pipeline was. Biota cover and height were low in the benthic surrounds of WTA. A higher percentage (<1-12 percent) of gravel and pebble were seen at all distance from WTA than around other SPJs, although sand/mud were still the dominant habitat representing 74-85 percent of the cover (Figure 8-50 and Figure 8-51). Jewel anemone was present at all distances in low percent cover (1-5 percent) as were sponges (<1 percent). Branching sponges were only seen near the SPJ (0-30 metres).

Dactylia sp. were only present around 30-60 metres away from the SPJ and massive forms were only observed in distances greater than 120 metres away (AIMS, 2022a).

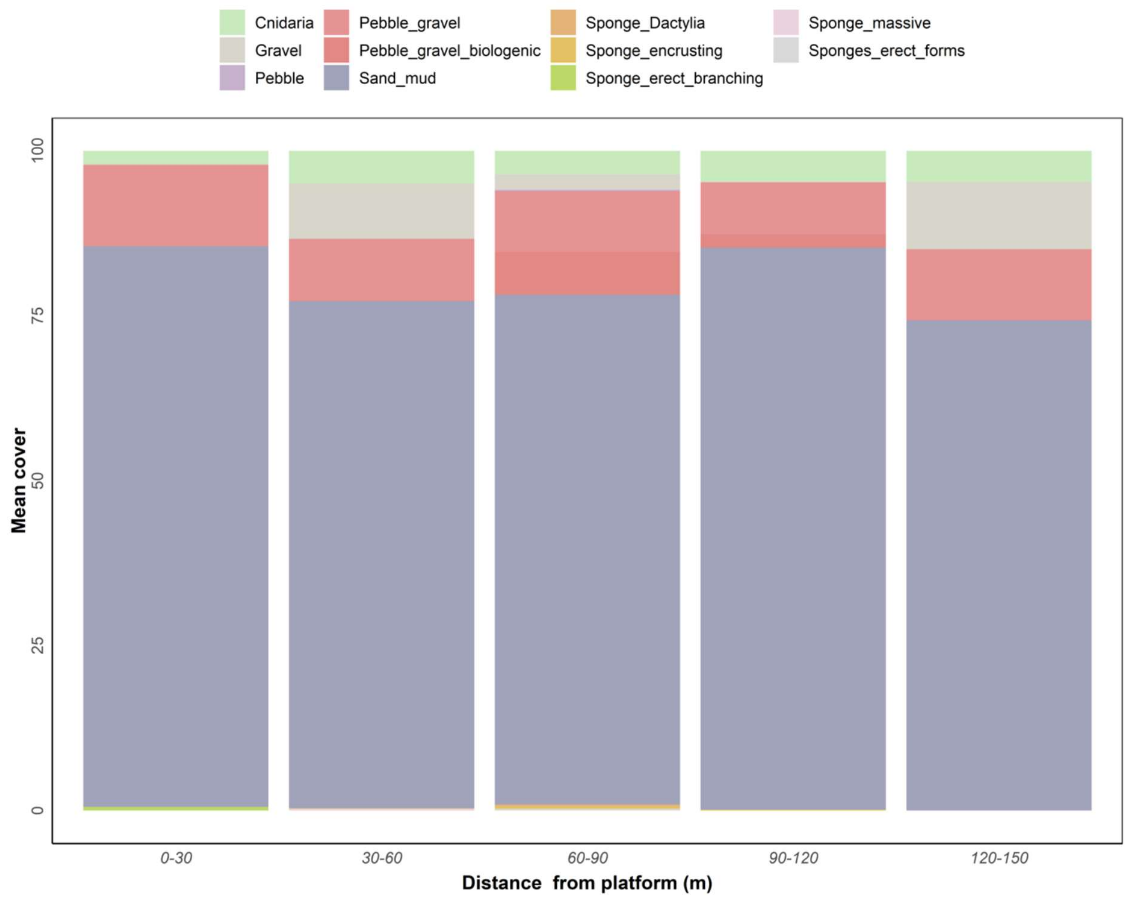


Figure 8-50 Average percent cover of living biota communities and substrate categories at Whiting

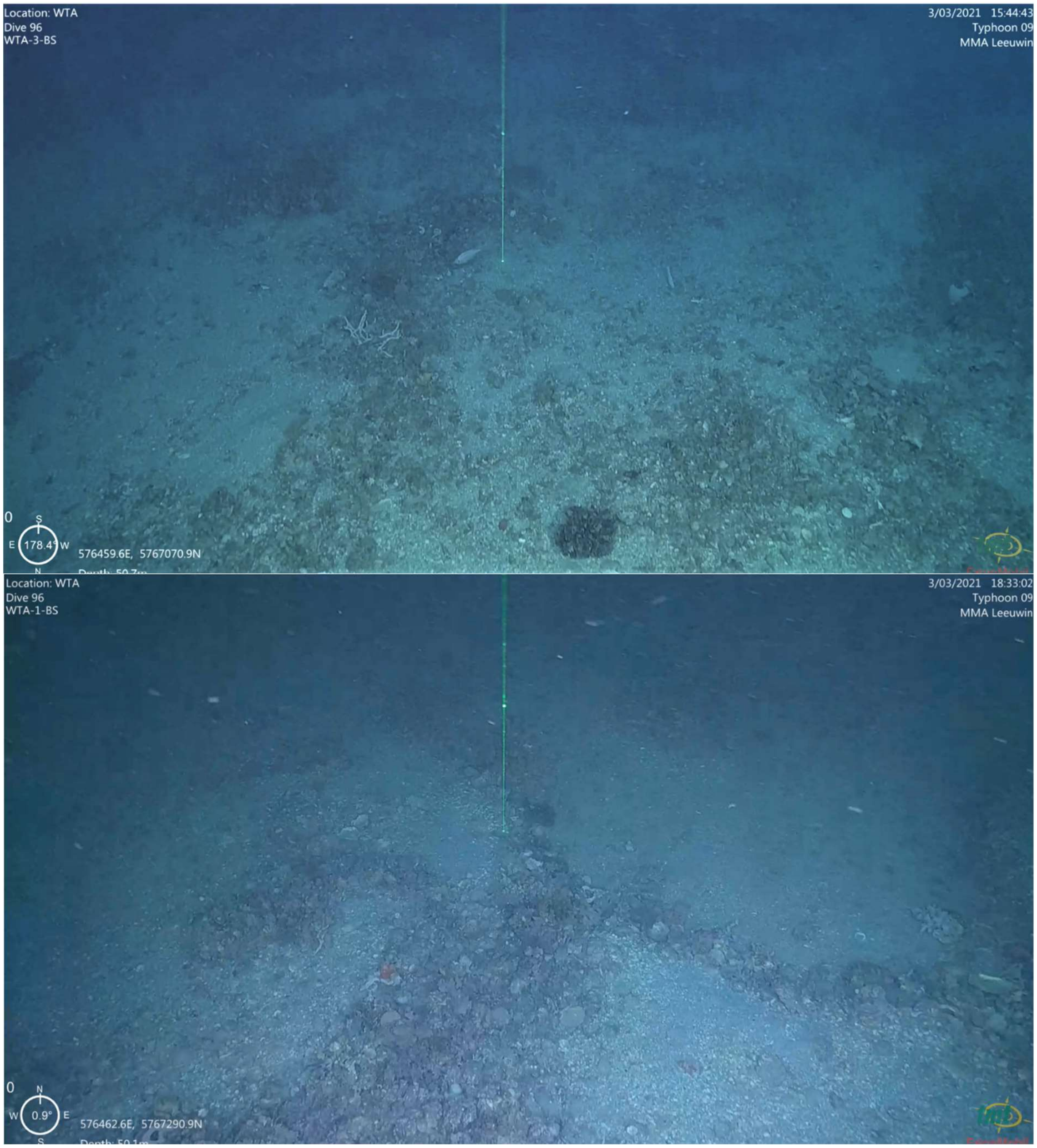


Figure 8-51 ROV images from Whiting benthic surrounds

8.4.2.6.6 Kingfish A benthic surrounds

The seabed surrounding KFA was flat with medium grained sediments that possessed shell grit. There were infrequent patches of medium density invertebrates (mostly sponges), some areas present in quite high density.

Biota height and cover was low in the benthic surrounds of KFA (Figure 8-52 and Figure 8-53). Jewel anemone were seen at all distances from the SPJ (4-12 percent cover), although sand/mud was the dominant benthic habitat (88-95 percent). Encrusting, erect and massive forms of sponges were observed from near the SPJ (0-30 metres) up to 120 metres away in low percent cover (<1 percent), except for a peak of 6.4 percent at 0-30 metres.

Callyspongiidae were only seen near the SPJ (0-30 metres) in low cover (<1 percent) (AIMS, 2022a).

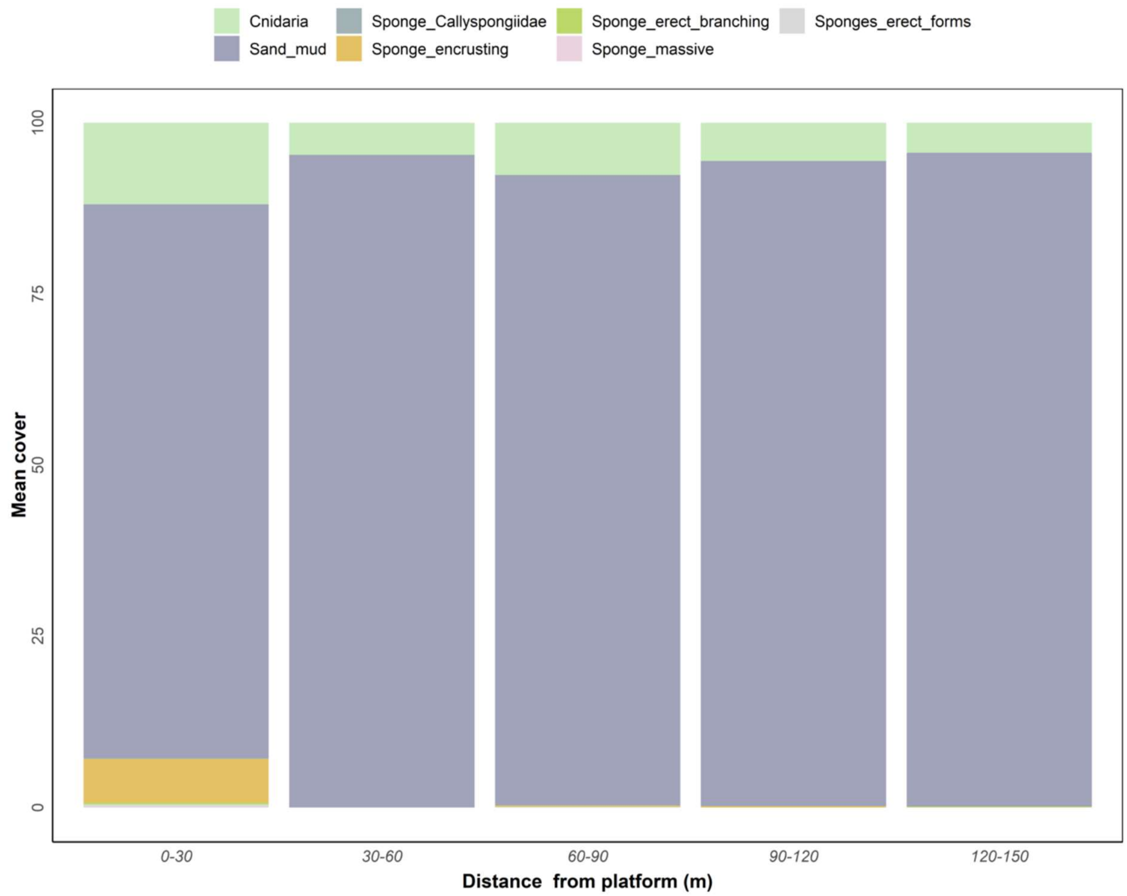


Figure 8-52 Average percent cover of living biota communities and substrate categories at Kingfish A

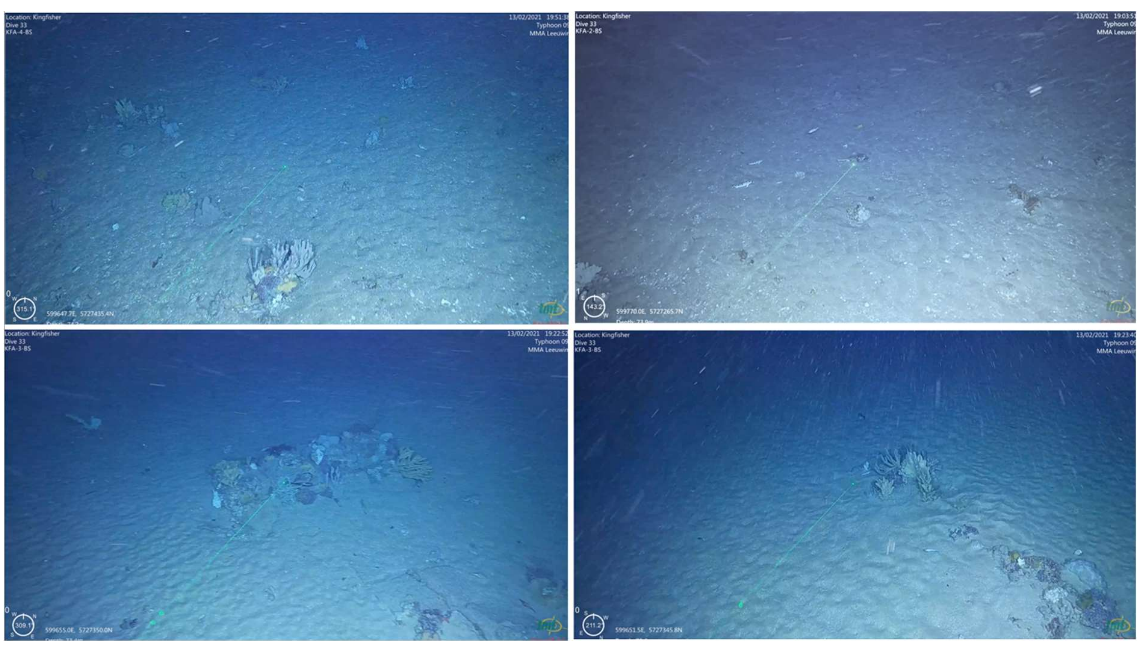


Figure 8-53 ROV images from Kingfish A benthic surrounds

8.4.3 Fish observations at Steel Piled Jackets

A study of platforms in the Bass Strait, which included the SPJs at BMA, CBA, FLA, and FTA, documented 1526 larval and early-stage juvenile fishes from an assortment of epipelagic/coastal-, meso-benthopelagic/oceanic-, soft substrate- and rock/reef-associated taxa (Neira, 2005). The most abundant species, in terms of individuals, were greenback horse mackerel (*Trachurus declivis*), followed by dragonet (*Bovichtus angustifrons*), king gar (*Scomberesox saurus*), redfish (*Centroberyx affinis*) and Australian salmon (*Arripis trutta*).

The fish assemblages observed during Environmental Survey 1 (Summer) recorded a total of 123,852 individual fishes from 69 taxa spanning 41 families. Figure 8-54 and Figure 8-55 summarise the total number of individuals and number of species observed during Environmental Survey 1 (Summer) respectively and data from the review of historic ROV footage for those SPJs not surveyed as part of Environmental Survey 1 (Summer).

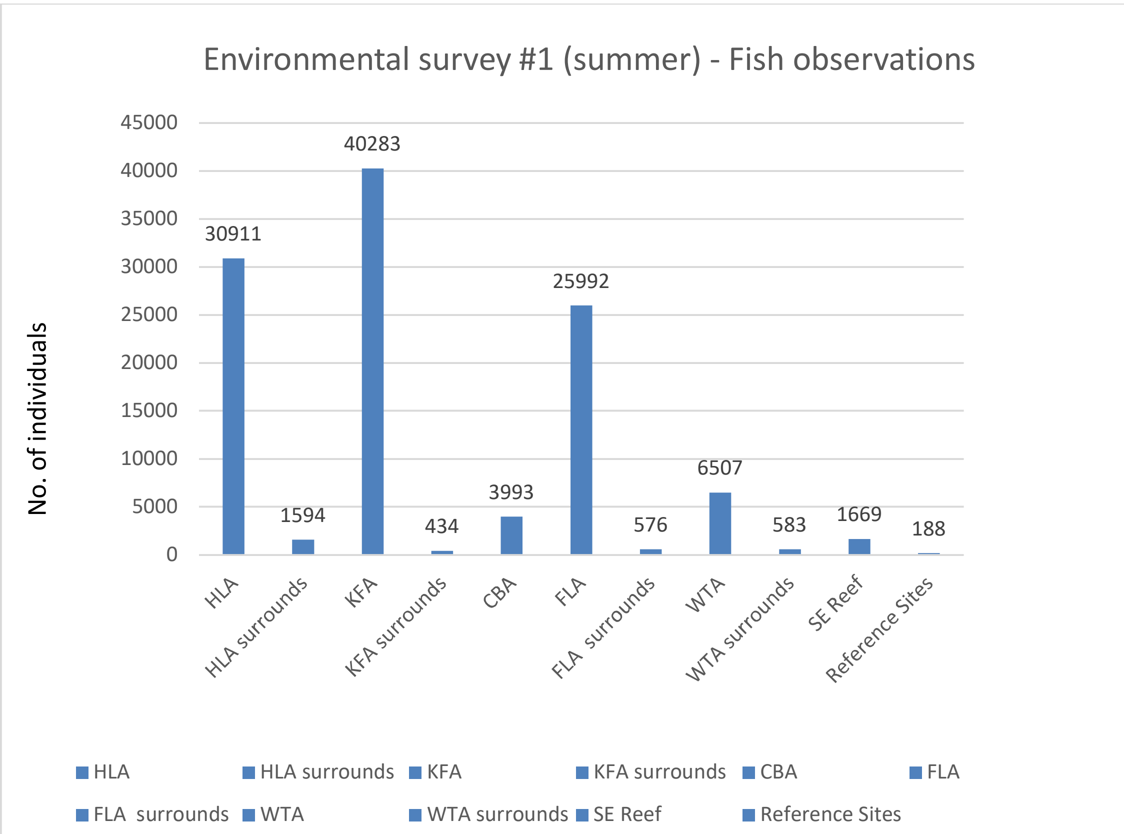


Figure 8-54 Number of individuals of fish observed around Steel Piled Jackets in the Bass Strait

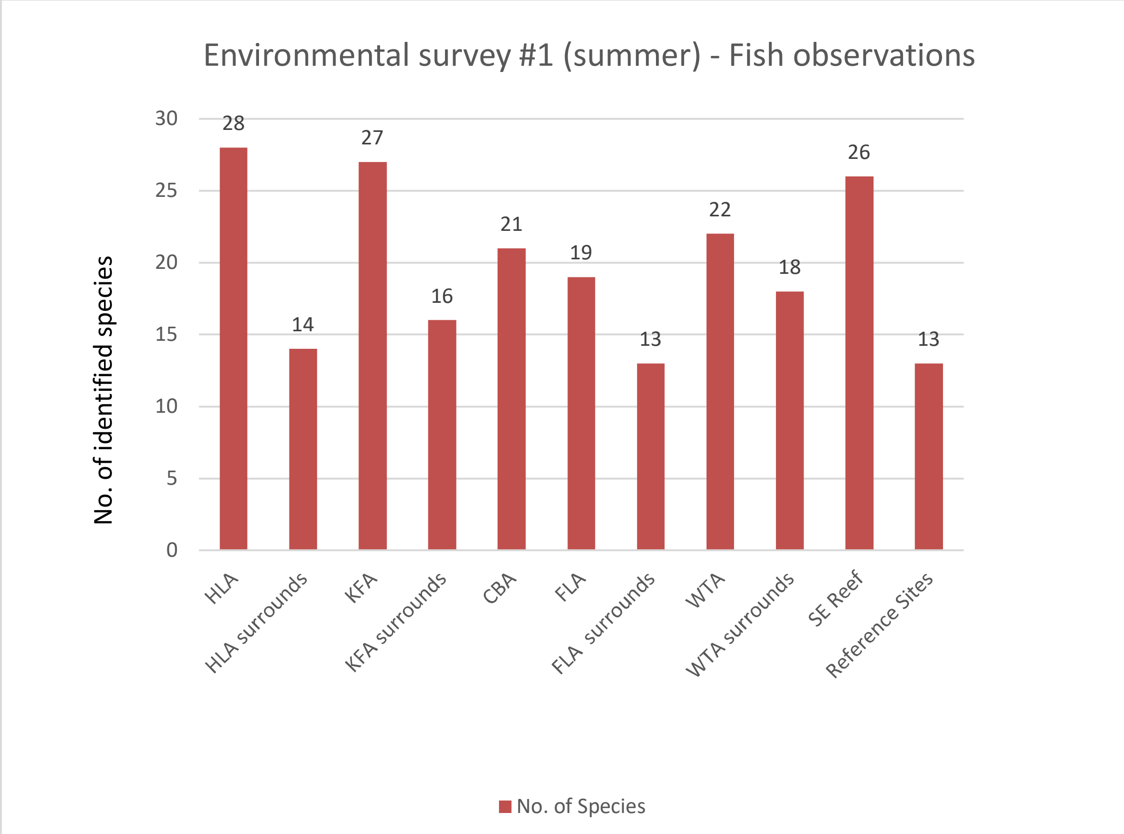


Figure 8-55 Number species of fish observed around Steel Piled Jackets in the Bass Strait

Fish observations recorded for Environmental Survey 1 (Summer) are summarised in Appendix E.

The review of historic ROV footage did not produce location specific fish counts however overall assessments of species richness, abundance and key species observed were assessed (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b). A summary of the fish species noted during the review of historical ROV footage is presented in Table 8-8.

Table 8-8 Summary of fish species associated with Steel Pile Jackets – based on review of historical ROV footage

SPJ	Estimated species richness	Estimated species abundance	Types of fish species noted in historical ROV footage	Year of imagery
BMA	Medium	Medium to high	Sweeps, perch, school of jackass morwongs, leatherjackets	2018
CBA	Medium	High	Perches, wrasses, scorpionfishes, bait fish, leatherjackets, jackass morwong, stinkfish, barred grubfish, drummers	2013, 2018

SPJ	Estimated species richness	Estimated species abundance	Types of fish species noted in historical ROV footage	Year of imagery
FLA	Medium	High	Baitfish, sweeps, jackass morwong, perch, leatherjackets, scorpionfish, draughtboard shark, cod	2015
FTA	Low	Medium	Perch, sweeps, banded morwong, jackass morwong	2018, 2014
HLA	High	High	Perches, mackerel, scorpionfishes, stinkfish, jackass morwong, wrasses, old wives, sweeps, fanbelly leatherjacket	2018, 2011
KFA	Medium	High	Perch, jackass morwong, sweeps, kelpfish	2015
KFB	High	High	Jackass morwong, perch, sweeps, scorpionfish, jack mackerels	2015
MKA	Medium	Medium	Sweepers, Barber perch, trevally, baitfish, crabs, jackass morwong, scorpionfish, and barred grubfish.	2018, 2013
WKF	High	High	Sweeps, perch, jack mackerel, longsnout boarfish, draughtboard shark, jackass morwong	2017
WTA	N/A	N/A	Limited video.	N/A

As can be seen in Table 8-8, the review of historical ROV footage identified that the SPJ's are supporting medium to high levels of fish abundance, thus supporting the conclusion that thriving and productive ecosystems have established over time in association with the structures.

The most abundant fishes observed in Environmental Survey 1 (Summer) tended to be small schooling species including *scad* (*Trachurus* spp.), butterfly perch (*Caesioperca lepidoptera*), and Australian anchovy (*Engraulis australis*) (AIMS, 2022a).

Assessment of the historic ROV imagery identified butterfly perch, silver sweep (*Scorpis lineolata*), sea sweep (*Scorpis aequipinnis*), and jackass morwong (*Nemadactylus macropterus*) among the predominant species identified at BMA, MKA, WKF and KFB, while redbait (*Emmelichthys nitidus*) was uniquely abundant at KFB and trevally (*Pseudocaranx* spp.) was abundant at WKF and MKA (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b).

Larger, often more mobile, species that were observed around the SPJs in Bass Strait included the smooth stingray (*Bathytoshia brevicaudata*), banded stingaree (*Urolophus cruciatus*), Port Jackson sharks (*Heterodontus portusjacksoni*) and draughtboard sharks (*Cephaloscyllium laticeps*) (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b). Sunfish (*Mola* spp.) were also observed around KFB and FLA (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b). An egg case of a draughtboard shark was observed attached to the WTA structure during Survey 1 (Refer to Figure 8-28).

Port Jackson sharks (*Heterodontus portusjacksoni*) were observed in historic ROV imagery in an aggregation at BMA (Figure 8-56). This behaviour was also more recently observed at the nearby BMB platform in (Figure 8-57). Both of these observations occurred during winter, and footage from summer periods in the Bream area did not record such aggregations. This observation illustrates usage of structures in the Bream area by this species and may be important for their management in the region. Port Jackson sharks are common bycatch in local fisheries (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b).

Port Jackson sharks are known to typically form aggregations for breading in late winter / early spring. A 2021 study of Port Jackson sharks showed strong preferences for particular reefs within and between breeding seasons. Males had significantly higher residency indices at their favoured sites relative to females, suggesting that males may be engaging in territorial behaviour. Conversely, female Port Jackson sharks exhibited higher roaming indices relative to males indicating that females may move between sites to assess males (Bass, et al., 2021).

Figure 8-56 Port Jackson sharks aggregation at Bream A captured in historic remotely operated vehicle footage from 2018

Figure 8-57 Port Jackson sharks aggregation at Bream B captured in remotely operated vehicle footage from August 2022

Most of the key observed species were found in greater abundance at depths greater than 26 metres (AIMS, 2022a) (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b). Species richness is greater in deeper waters, and where large numbers of individuals were seen in shallower depths (above -55 metres) this was due to schools of pelagic fish such as scad at HLA, CBA, KFA, KFB, FLA and WTA, trevally at CBA, KFA, WKF and FLA, sea sweep at HLA, KFA, KFB, WKF and WTA, silver sweep at HLA, CBA, KFB, WKF and FLA, and Australian anchovy at HLA, KFA and FLA (AIMS, 2022a) (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b).

Five species observed around the SPJs are considered endemic to Australia: the draughtboard shark, redfish, common gurnard perch (*Neosebastes scorpaenoides)*, mado (*Atypichthys strigatus*) and white-ear scalyfin (*Parma microlepi*) (AIMS, 2022a) (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b).

Examples of some of the observed species caught by commercial and/or recreational fisheries seen around the SPJs (AIMS, 2022a) (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b) include:

- jackass morwongs
- banded morwongs (*Cheilodactylus spectabilis*)
- grey morwong (*Nemadactylus douglasii*)
- redfish
- trevally
- Australian anchovy

- reef ocean perch (*Helicolenus percoides*)
- eastern orange perch (*Lepidoperca pulchella*)
- sea sweep
- silver sweep
- barracouta (*Thyrsites atun*)
- longsnout boarfish (*Pentaceropsis recurvirostris*)
- striped trumpeter (*Latris lineata*)
- scorpionfish (*Scorpaena* spp.)

8.4.3.1 Depth-related patterns in fish communities

Fish communities were observed to vary with depth around the SPJs. Depth variation and habitat use are important for assessing the value of the SPJs in these locations, along with assessing potential end state habitats and their future value to species presence.

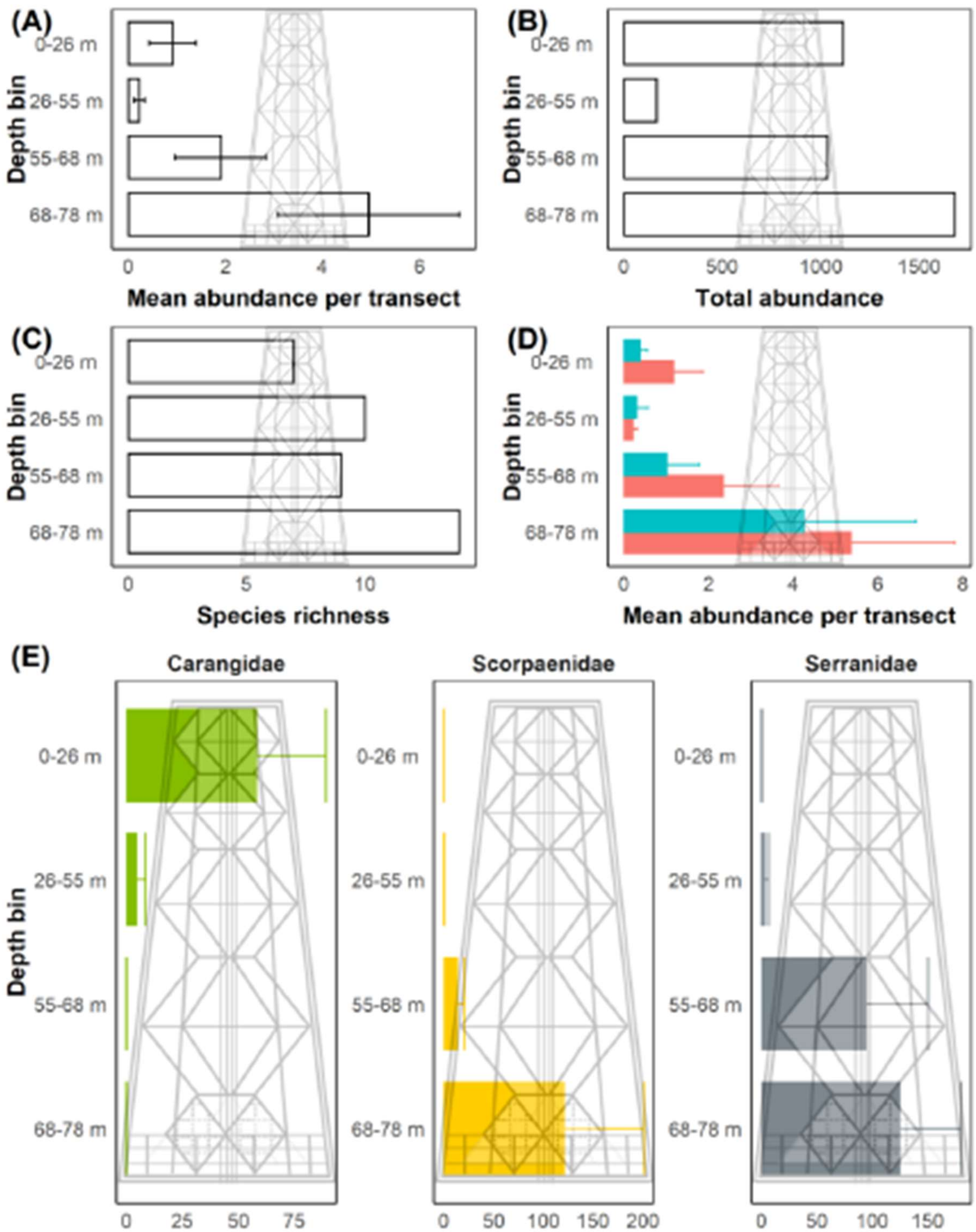
8.4.3.1.1 Cobia

A total of 3993 fish from 21 taxa spanning 17 families were recorded on ROV visual transects performed at CBA. Mean fish abundance per transect was low in depths less than 55 metres and peaked, as did fish taxonomic richness, total abundance and the abundance of fishery target taxa, at the seabed on CBA (AIMS, 2022a). The biggest jump in fish taxonomic richness on CBA occurred between 55-78 metres with the addition of 14 species in this depth range. The 3993 fish observed on CBA equates to 3.7 individuals per metre of structure surveyed (AIMS, 2022a). Fish communities changed with increasing depth on CBA. Fish abundance bar plots for CBA are included in Figure 8-58.

The three most abundant families are shown in Figure 8-58. Carangidae includes scad and trevally with abundances greatest in depths less than 26 metres (AIMS, 2022a).

Scorpaenidae spp. includes a single species (*Scorpaena* sp.) which were extremely abundant (n = 607) at the base of CBA. Serranidae includes two species on CBA (butterfly perch and halfbanded seaperch (*Hypoplectrodes maccullochi*)) with greatest abundances below 55 metres water depth (Figure 8-58).

Fish species associated with the upper water column at the SPJ were sea sweep and scad, while those present in depths below 55 metres included Australian anchovy, butterfly perch, rosy wrasse *(Pseudolabrus rubicundus)*, reef ocean perch, *Scorpaena* spp., *Pseudophycis* spp., and velvet leatherjacket (*Meuschenia scaber*).



A) Mean fish abundance per transect within each depth band (± SE).
B) Total abundance of fish observed in each depth band.
C) Taxonomic richness (total number of fish taxa observed) in each depth band.
D) Mean abundance of fishery target taxa (blue) and non-target taxa (pink) across transects within each depth band (± SE); E) mean abundance of most abundant families per transect within each depth band (± SE).

Figure 8-58 Bar plots of fish metrics for Cobia

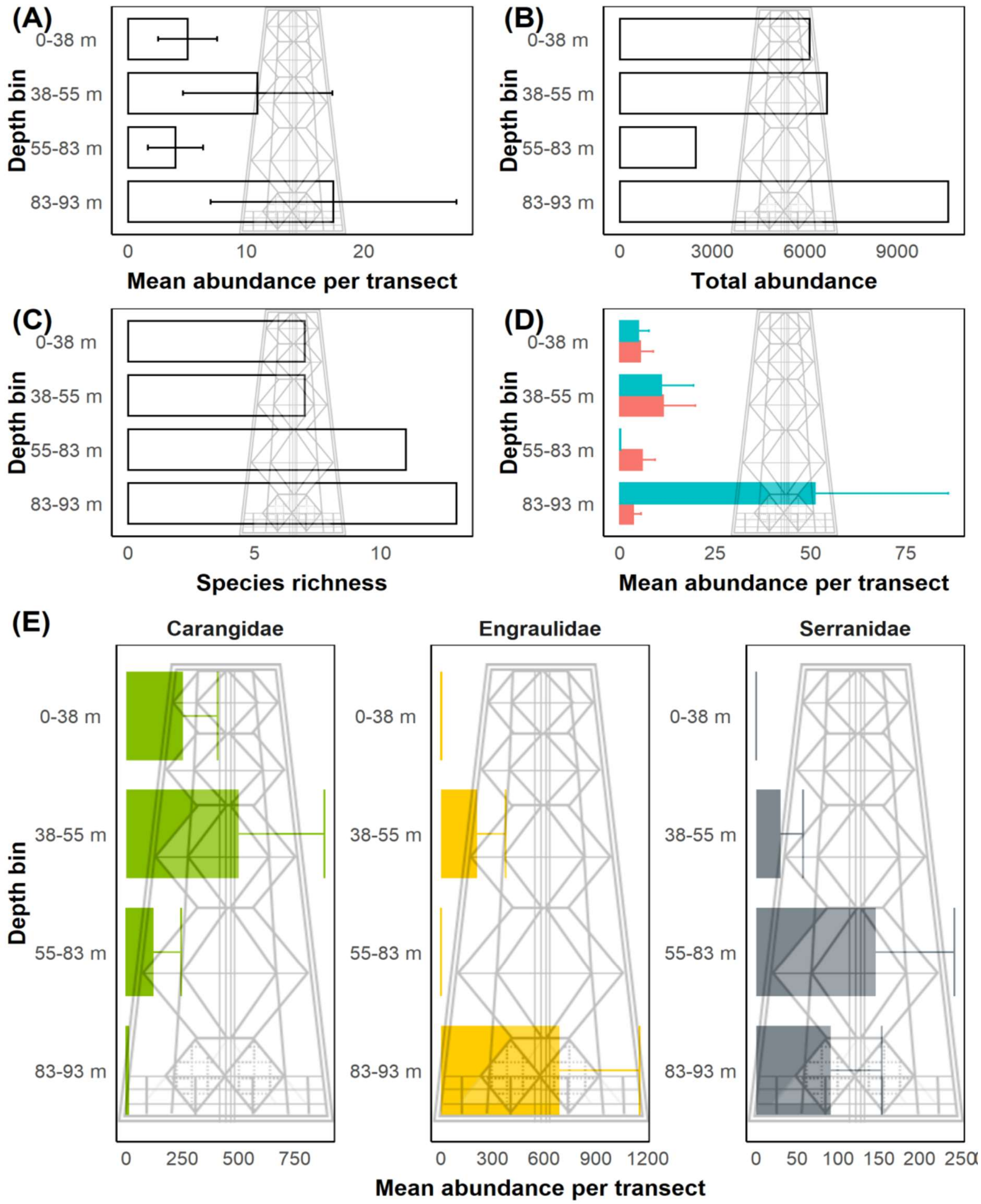
8.4.3.1.2 Flounder

A total of 25,992 fish (20.8 individuals per metre of structure surveyed) from 19 taxa and 13 families were recorded on ROV visual transects at FLA. FLA was the deepest SPJ surveyed (93 metres), yet no taxa were unique to this SPJ in the deepest sections. Patterns in mean and total abundance on FLA were driven by abundant schooling taxa in certain depths (scad, silver sweep in 0-38 metres, butterfly perch, Australian anchovy in >55 metres) (Figure 8-59). The high abundance of fishery target taxa at the seabed was driven by Australian anchovy and a number of other species only present in this section of FLA (e.g. jackass morwong, reef ocean perch; Figure 8-59). Species richness was similar between 0-38 and 0-55 metres, with a single species added between 38-55 metres (AIMS, 2022a).

Fish abundance bar plots for FLA are included Figure 8-59 (AIMS, 2022a).

The abundance composition of fish communities on FLA changed with increasing depth. Several sweep species were associated with depths <38 metres on FLA while a number of demersal fish species were associated with depths beyond 55 metres. The pelagic Australian anchovy was also associated with the base of FLA. Most of the fish species associated with the deeper sections of FLA were only observed there during Environmental Survey 1 (Summer) (AIMS, 2022a).

Benthic surrounds transects were able to be completed for FLA. A total of 576 individuals from 13 fish species were observed in the surrounds of FLA. Fish abundance and species richness declined with increasing distance away from the SPJ out to 150 metres.



A) Mean fish abundance per transect within each depth band (± SE).
B) Total abundance of fish observed in each depth band.
C) Taxonomic richness (total number of fish taxa observed) in each depth band.
D) Mean abundance of fishery target taxa (blue) and non-target taxa (pink) across transects within each depth band (± SE).
E) Mean abundance of most abundant families per transect within each depth band (± SE).

Figure 8-59 Bar plots of fish metrics for Flounder

8.4.3.1.3 Halibut

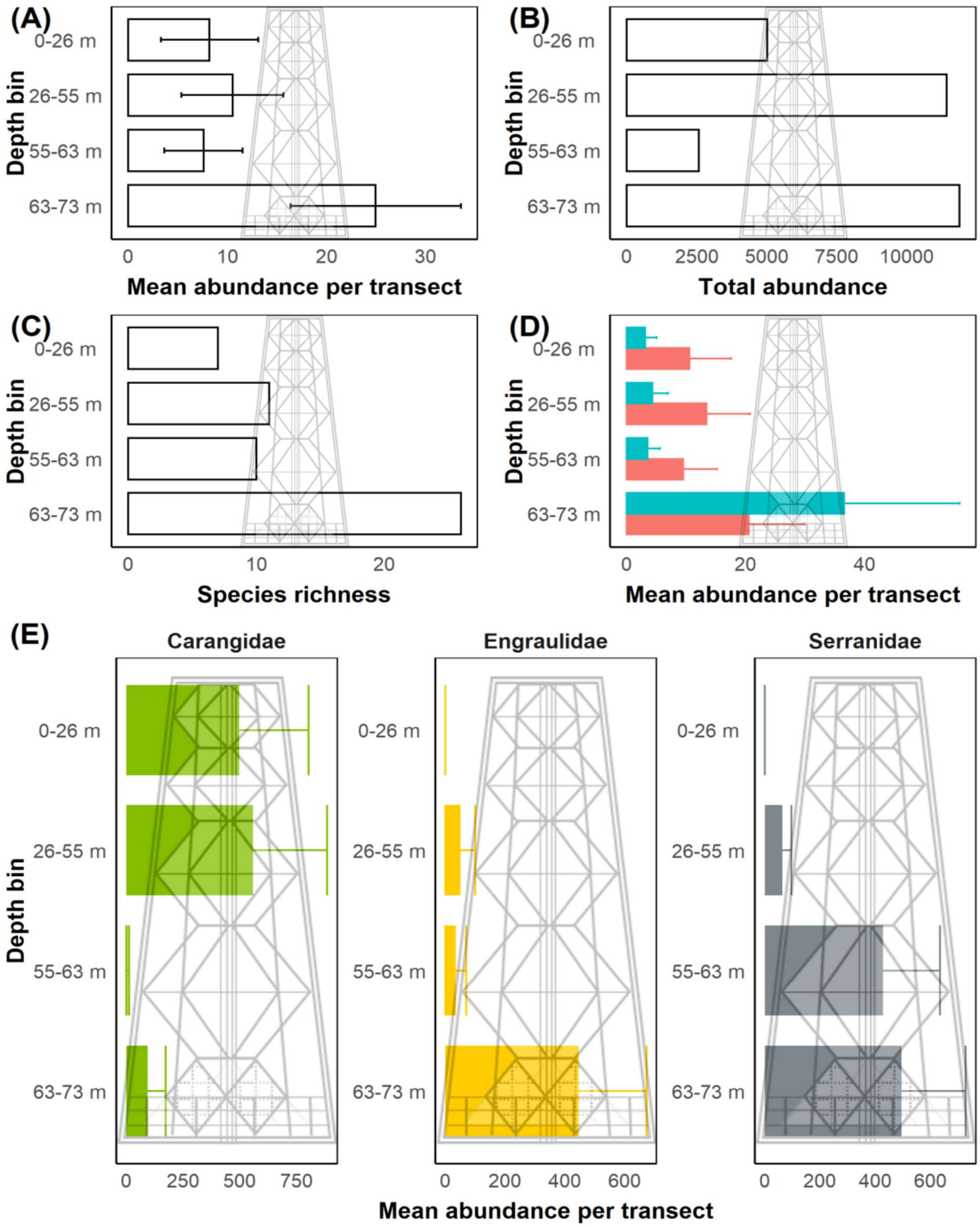
A total of 30,909 fish from 28 taxa spanning 21 families were recorded on ROV visual transects at HLA. The 30,909 fish recorded on HLA equates to 32.3 individuals per metre of structure surveyed. Similarly to other SPJs, fish taxonomic richness and abundance peaked near the seabed on HLA (63-73 metres) (Figure 8-60). The abundance composition of fish communities on HLA changed with increasing depth. Examination of the depth-bands showed that this was driven by changes in fish communities across all depth with the exception of between 26-55 metres and 55-63 metres. Silver sweep and halfbanded seaperch were associated with depths of 26-55 metres while 19 fish species were associated with the base of HLA (63-73 metres), with most only observed in this section of the SPJ (AIMS, 2022a). The greatest fish taxonomic richness was added in the 63-73 metre depth range section of HLA with the addition of 12 taxa unique to this section of the SPJ. Scorpionfish, jackass morwong, splendid perch (*Callanthias australis*) and reef ocean perch were most abundant in the deep section (63-73 metres) (AIMS, 2022a).

Fish abundance bar plots for HLA are included Figure 8-60 (AIMS, 2022a).

Benthic surrounds transects were completed for HLA. A total of 1594 individuals from 14 fish species were observed in the surrounds of HLA. Of these 14 species, five were not observed on the SPJ itself:

- common stinkfish (*Foetorepus calauropomus*)(n = 76)
- barred grubfish (*Parapercis allporti*)(n = 67)
- unknown gurnard (*Triglidae* spp.)(n = 16)
- gurnard perch (*Neosebastes* spp.)(n = 3)
- gurnard (*Lepidotrigla* spp.)(n = 2).

Fish abundance peaked at 60-90 metres distance where a school of Australian anchovy) were observed around the concrete mattress. Fish species richness was highest more than 30 metres from the SPJ (AIMS, 2022a).



A) Mean fish abundance per transect within each depth band (± SE).
B) Total abundance of fish observed in each depth band.
C) Taxonomic richness (total number of fish taxa observed) in each depth band.
D) Mean abundance of fishery target taxa (blue) and non-target taxa (pink) across transects within each depth band (± SE).
E) Mean abundance of most abundant families per transect within each depth band (± SE).

Figure 8-60 Bar plots of fish metrics for Halibut

8.4.3.1.4 Whiting

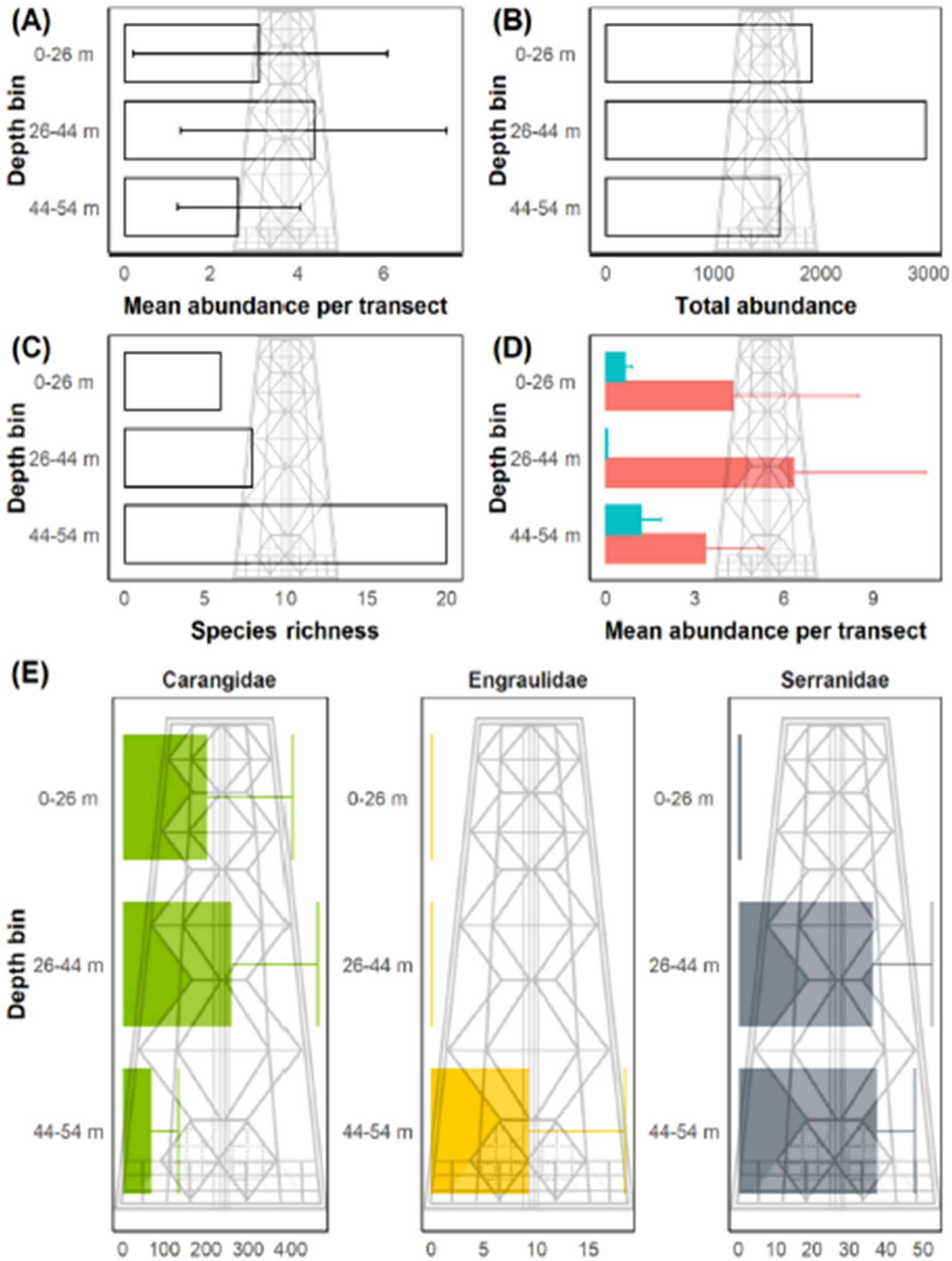
A total of 6507 fish from 22 taxa spanning 16 families were recorded on at WTA. The 6507 fish observed at WTA equates to 12.7 fish per metre of structure surveyed. Similar to other SPJs, fish taxonomic richness was highest at the base of WTA (44-54 metres depth) where an additional 12 taxa were uniquely viewed (AIMS, 2022a).

Fish abundance bar plots for WTA are included Figure 8-61 (AIMS, 2022a).

The three most abundant families are shown in Figure 8-61. A school of scad dominated abundance with 5243 individuals (81 percent of all individuals) and most were observed in 26-44 metres depth. Most abundant in the 0-26 metres was sea sweep and skipjack trevally. Butterfly perch were most abundant in depths beyond 26 metres driving the high abundance of Serranidae species (AIMS, 2022a).

A total of 582 individuals from 17 fish taxa were observed in the benthic surrounds of WTA. The greatest number of fish taxa were observed in the surrounds of WTA compared to the surrounds of the other SPJs surveyed. Despite this high taxonomic richness, the ROV was higher off the ground in the benthic surrounds for WTA compared to other platforms which made species identification difficult and likely resulting in underestimates of fish taxa and abundance (AIMS, 2022a). An additional 11 fish taxa were observed in the surrounds but not on the SPJ itself. Abundant examples include *Triglidae* spp. (n = 84) and silverbelly *(Parequula melbournensis*)(n = 42).

A white shark was viewed on one surrounding transect. The total abundance of fish in the surrounds of WTA was low near to the SPJ and peaked 60-90 metres away. Fish taxonomic richness was also greatest 60-90 metres away.



A) Mean fish abundance per transect within each depth band (± SE).
B) Total abundance of fish observed in each depth band.
C) Taxonomic richness (total number of fish taxa observed) in each depth band.
D) Mean abundance of fishery target taxa (blue) and non-target taxa (pink) across transects within each depth band (± SE).
E) Mean abundance of most abundant families per transect within each depth band (± SE).

Figure 8-61 Bar plots of fish metrics for Whiting

8.4.3.1.5 Kingfish A

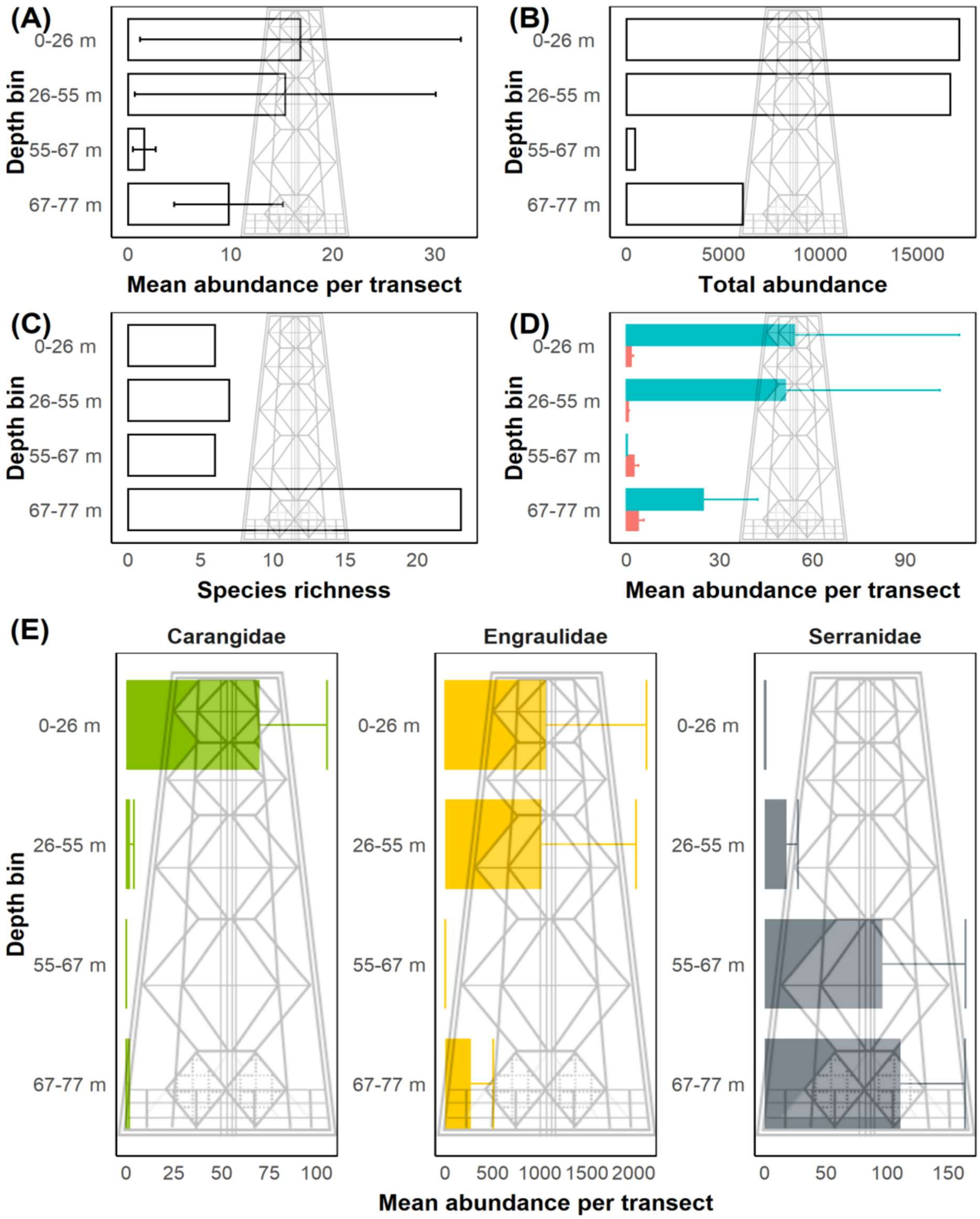
A total of 40,283 fish from 27 species and 19 families were recorded on ROV visual transects at KFA. KFA had the highest abundance of fish observed of all SPJs (40,283) equating to 28.5 fish per metre of structure surveyed, with 90 percent of individuals comprising of the Australian anchovy which was very abundant on KFA in depths <55 metres (AIMS, 2022a). Fish taxonomic richness was highest at the KFA structure base (67-77 metres depth) where an additional 17 fish taxa were added. Peaks in abundance near the seabed were observed for butterfly perch, splendid perch, redfish, scorpionfish, jackass morwong, reef ocean perch and silver sweep (AIMS, 2022a).

The abundance composition of fish communities on KFA changed with increasing depth. Similar to other SPJs, many fish taxa (primarily demersal taxa with restricted home ranges) were associated with the base of the structure. Here, peaks in abundance were noted for most taxa on this SPJ, including several fishery target groups (e.g. jackass morwong) (AIMS, 2022a).

Fish abundance bar plots for KFA are included in Figure 8-62.

Abundant in the shallow sections of the SPJ were sea sweep, trevally and scad. The high abundance of fishery target taxa in the shallows was driven by schooling anchovy, sweep and trevally (AIMS, 2022a).

A total of 434 individuals from 16 fish taxa were observed in the benthic surrounds of KFA. Of these 16, eleven were not also present on the SPJ itself. The most abundant fish taxa unique to the surrounds of KFA (not on the SPJ) included: barred grubfish (n = 98), unknown gurnard (n = 67) and common stinkfish (21). Red cod (*Pseudophycis* spp.) were also abundant in the surrounds (n = 98) but present in low abundance on KFA (n = 8). Fish abundance and fish taxonomic richness declined with increasing distance away from the SPJ out to 150 metres (AIMS, 2022a).



A) Mean fish abundance per transect within each depth band (± SE).
B) Total abundance of fish observed in each depth band.
C) Taxonomic richness (total number of fish taxa observed) in each depth band.
D) Mean abundance of fishery target taxa (blue) and non-target taxa (pink) across transects within each depth band (± SE).
E) Mean abundance of most abundant families per transect within each depth band (± SE).

Figure 8-62 Bar plots for Kingfish A

8.4.4 Marine Mammals

The only marine mammal observed in reviews of ROV footage of the SPJ surroundings was the Australian fur seal (*Arctocephalus pusillus doriferus*). The Australian fur seal is a protected species under the EPBC Act.

Australian fur seals are frequently observed by SPJ operators aggregated and hauling-out on the SPJs as can be seen in Figure 8-63 to Figure 8-65.

Reviewed imagery confirmed sightings of Australian fur seals at:

- KFB and WKF, as well as most other SPJs (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b)
- HLA, CBA, FLA, WTA (AIMS, 2022a).

None were observed at reference or South East Reef locations (AIMS, 2022a).

Australian fur seals are usually seen in water depths shallower than 55 metres, however were also observed in the benthic surrounds of FLA, which has a water depth of 93 metres (AIMS, 2022a).

Figure 8-63 Australian fur seals observed hauling-out at Kingfish A

Figure 8-64 Australian fur seals observed aggregating at Fortescue

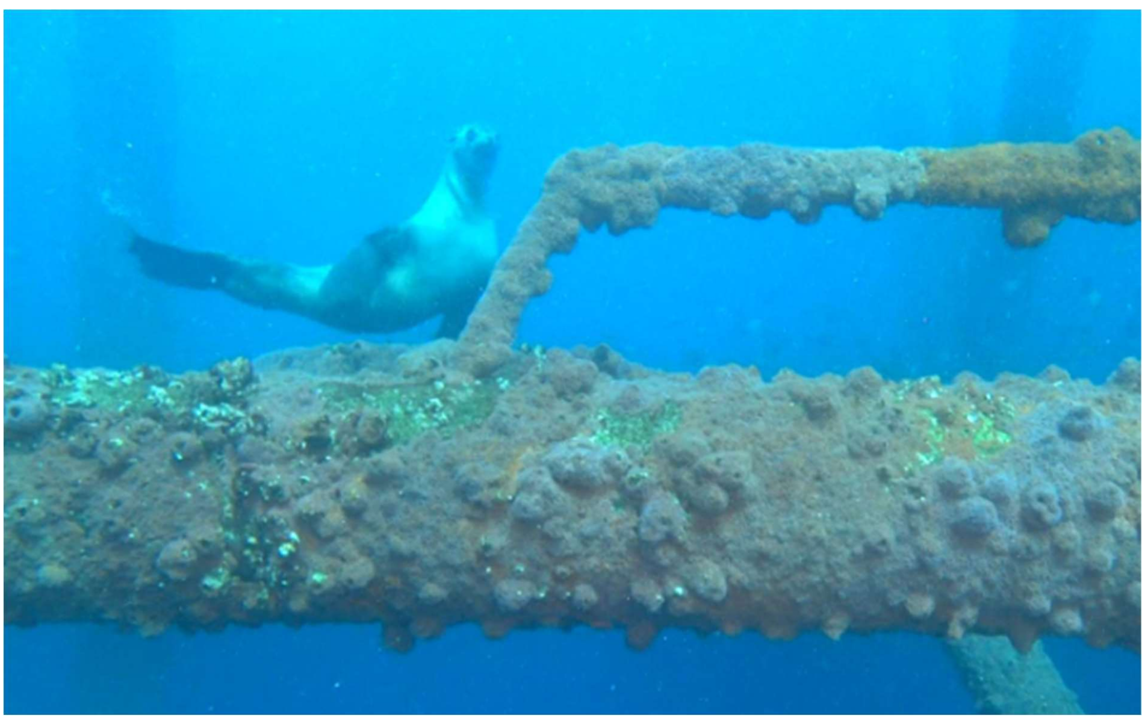


Figure 8-65 Australian fur seal observed at Flounder

Australian fur seals are predominantly benthic predators and exhibit a high degree of foraging site fidelity (AIMS, 2022a), which means they tend to repeatedly use the same ground over multiple foraging trips.

The documented breeding distribution of Australian fur seals as shown in Figure 8-66 (AIMS, 2022a) is restricted to Bass Strait with breeding colonies located on coastal islands across the region (AIMS, 2022a).

Females have been noted to restrict their foraging trips to a distance of 200 kilometres from the coast whereas males forage across the south-eastern continental shelf (AIMS, 2022a). All SPJs are within the foraging range of females and almost all are in range for nearby breeding colonies in the area (AIMS, 2022a).

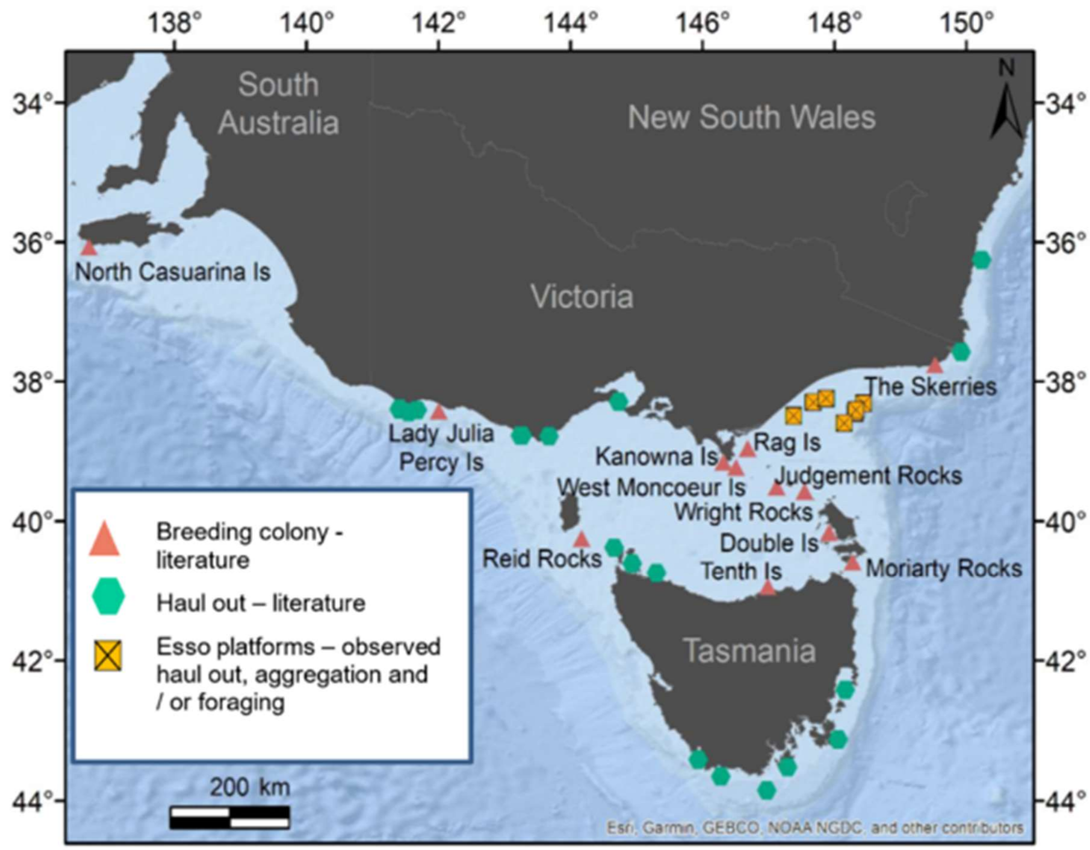


Figure 8-66 Locations of published Australian fur seal breeding colonies and haul-out sites

Tracked seals from the Kanowna Island breeding colony were recorded spending time near anthropogenic structures including oil and gas wells and pipelines, with four seals concentrating their foraging in the vicinity of oil and gas infrastructure (Arnould, et al., 2015). Seal foraging behaviour in association with offshore structures have also been reported in opportunistic ROV imagery recorded northern hemisphere (Todd, et al., 2020)

Observation ROV video from Environmental Survey 1 (Summer) data showed seals using the ROV light beam at night to hunt and capture prey indicating they are able to utilise artificial habitats to forage. Seals were also observed during the day, swimming in front of the ROV and capturing scad. An example of this behaviour is shown in Figure 8-67.

Figure 8-67 Australian fur seal foraging in front of the remotely operated vehicle

Animal-borne camera tags and stable isotope analysis have shown that bentho-pelagic prey such as scad are an important part of Australian fur seal diets, particularly for females (AIMS, 2022a). Other fish species noted in large numbers around SPJs are targeted as prey by Australian fur seals, including reef ocean perch, butterfly perch and Scorpaeniformes (AIMS, 2022a).

In order to achieve acceptability and ALARP criteria for shipping and in particular to comply with IMO Standard 3.6 (refer section 2.2.1) and provide an unobstructed water column sufficient to ensure safety of navigation, not less than 55 metres from the mean sea level, all proposed SPJ end state options involve the removal of SPJ structures to at least a depth of 55 metres below MSL.. This will involve the removal of any structures above the sea surface and will therefore remove haul-out resting and refuge opportunities for Australian fur seals. To maintain haul-out sites, above sea surface structures would need to be retained. This option was assessed as ‘not feasible’ – refer Section 3.2.4.3.

The proposed SPJ end states will also result in the removal of the upper sections that likely attract the large schools of Australian anchovy and scad on which Australian fur seals were observed to feed. All proposed SPJ end state options will likely alter the behaviour of Australian fur seals in the region via the removal of resting habitat and foraging opportunities (AIMS, 2022a). Due to the shallow water depth and the need to remove the WTA and BMA SPJs to as close as practicable to the seabed, the loss of foraging habitat is expected to be most pronounced for any seals that may have established foraging routines strongly associated with either of those facilities. Some individuals (such as adult males which tend to remain away from colonies for longer) may continue to utilise the SPJ structures post decommissioning.

8.4.5 Additional fauna groups

Although marine turtles and cetaceans are known to occur in the area, none were observed during the Environmental Survey 1 (Summer) or review of historic ROV footage.

Although not observed, two sharks listed as migratory under the EPBC Act have habitat likely to occur in the OAs: shortfin mako (*Isurus oxyrinchus*) and porbeagle (*Lamna nasus*).

The following protected reptile and cetaceans are also identified as potentially having habitat or occurring in the OAs:

- Loggerhead turtle – endangered and migratory
- Leatherback turtle – endangered and migratory
- Green turtle – vulnerable and migratory
- Blue whale – endangered and migratory
- Southern right whale – endangered and migratory
- Humpback whale – vulnerable and migratory
- Dusky dolphin (*Lagenorhynchus obscurus*) – migratory
- Bottlenose dolphin (*Tursiops truncatus*) – protected.

One EPBC listed species of shark – the white shark was observed in the benthic surrounds of WTA during Environmental Survey 1 (Summer) (AIMS, 2022a).

A single Australian longnose skate (*Dentiraja confusa*) was observed at a SPJ reference location during Environmental Survey 1 (Summer) (AIMS, 2022a). The Australian longnose skate is not EBPC listed however is classified as critically endangered under *The IUCN Red List of Threatened Species* (IUCN, 2022).

8.4.6 Ecological value of structures

Many local and international studies have found that the presence of oil and gas infrastructure (or artificial reefs) add hard substrate to the marine environment, supporting a great diversity of marine life by providing a habitat for fish and other invertebrates that otherwise would not exist in a soft substrate environment (Sammarco, Atchison, Boland, Sinclair, & Lirette, 2012). ROV footage reviewed by AIMS confirms that the SPJs support thriving ecological communities rich in species diversity and abundance in comparison to surrounding reference sites. The analysis from Environmental Survey 1 (Summer) showed that the platforms surveyed are providing habitat for diverse fish communities and the fish assemblages observed on the platforms are unique for this offshore region of the Bass Strait and likely play an important role in the functioning of food webs in the area with representation of diverse trophic levels (AIMS, 2022a).

The benthic and fish communities currently being supported by the SPJs can be viewed as 'novel ecosystems' – a concept which is being recognised as a way of defining ecosystems altered, or bought about, by human activity (Van Elden, Meeuwig, Hobbs, & Hemmi, 2019). Conservation and remediation efforts have traditionally focused on restoring ecosystems that have been altered by human activity to their former state, however, the novel ecosystem approach recognises that in some cases restoration of ecosystems may actually result in the loss of ecosystem value and that these 'novel ecosystems' may in fact be providing ecosystem services that are more beneficial than those provided by the former state (Van Elden, Meeuwig, Hobbs, & Hemmi, 2019).

Benthic and fish communities colonising the SPJs have had significant time to develop (32-54 years) suggesting the structure of communities observed to be present are approaching an equilibrium (AIMS, 2022a). The SPJs are considered to be novel as the benthic and fish communities on the structures have been shown to be distinct from those that occur on the surrounding seabed – at reference sites (chosen as being located away from any influences from the SPJs) and at a nearby natural reef – known as South East Reef (AIMS, 2022a), which is located in approximately 70 metres of water depth in the proximity of FLA, CBA and HLA. The SPJs are also considered unique due to the number of structures present in a relatively small area of seabed that is predominantly gravel, sand and mud. There are no other natural or man-made structures which span the water column in this region and as such the communities that associate with, occupy, or colonise the structures can be considered novel (AIMS, 2022a).

Van Elden, Meeuwig, Hobbs, & Hemmi (2019) assessed the Wandoo field infrastructure (including an unmanned monopod, a CGS, a buoy with moorings and a pipeline end manifold) in the north-west shelf of Australia against novel ecosystems definition criteria. Environmental surveys at the Wandoo field concluded, similar to observations made at the SPJs, that the biota and habitat supported by the platforms was distinctly different from those observed at the sandy control sites and natural hard substrate in the area (Van Elden, Meeuwig, Hobbs, & Hemmi, 2019). The study found that the Wandoo field infrastructure may be classified as a novel ecosystem, given the environment and ecology of the site have been altered, a self-organising ecosystem with novel qualities has emerged and the presence of the platform prevents the ecosystem from returning to its historical state (which was impacted by fishing trawling activities).

This Section provides a discussion on the habitat value of the SPJs and hence why preserving aspects of the novel communities around the structures (by retaining the lower sections of the SPJs) is considered to represent a better environmental outcome than removing the SPJs to below the seabed entirely and allowing the habitat to return to a state more similar to that recorded at the reference sites.

This will be achieved by discussing the biomass, community composition (biodiversity), productivity measures of health of the communities inhabiting the SPJs – an approach suggested in Melbourne-Thomas, et al. (2021) to determine the conservation value of the habitat being retained. Changes to the biodiversity and habitat over time as a result of the slow degradation of the structures and how removal of the upper sections of the SPJs is expected to change the habitat value will also be discussed, as well as the potential ‘ecological connectivity’ of the structures between the individual structures and the natural surrounding areas.

8.4.6.1 Biodiversity of Steel Piled Jacket ecosystems versus natural ecosystems in the Gippsland Basin

If the SPJs were completely removed to below the seabed, the supported marine biota presence and abundance would, over time, return to a state similar to that observed at the reference sites studied during Environmental Survey 1 (Summer) (AIMS, 2022a). The natural surrounding ecosystems studied during this survey (sandy seabed reference sites and a natural reef area) were predominantly sand/mud and gravel with only patchy and sparse distributions of some epibenthic invertebrate species (AIMS, 2022a). This can be seen in Figure 8-68 and Figure 8-69.

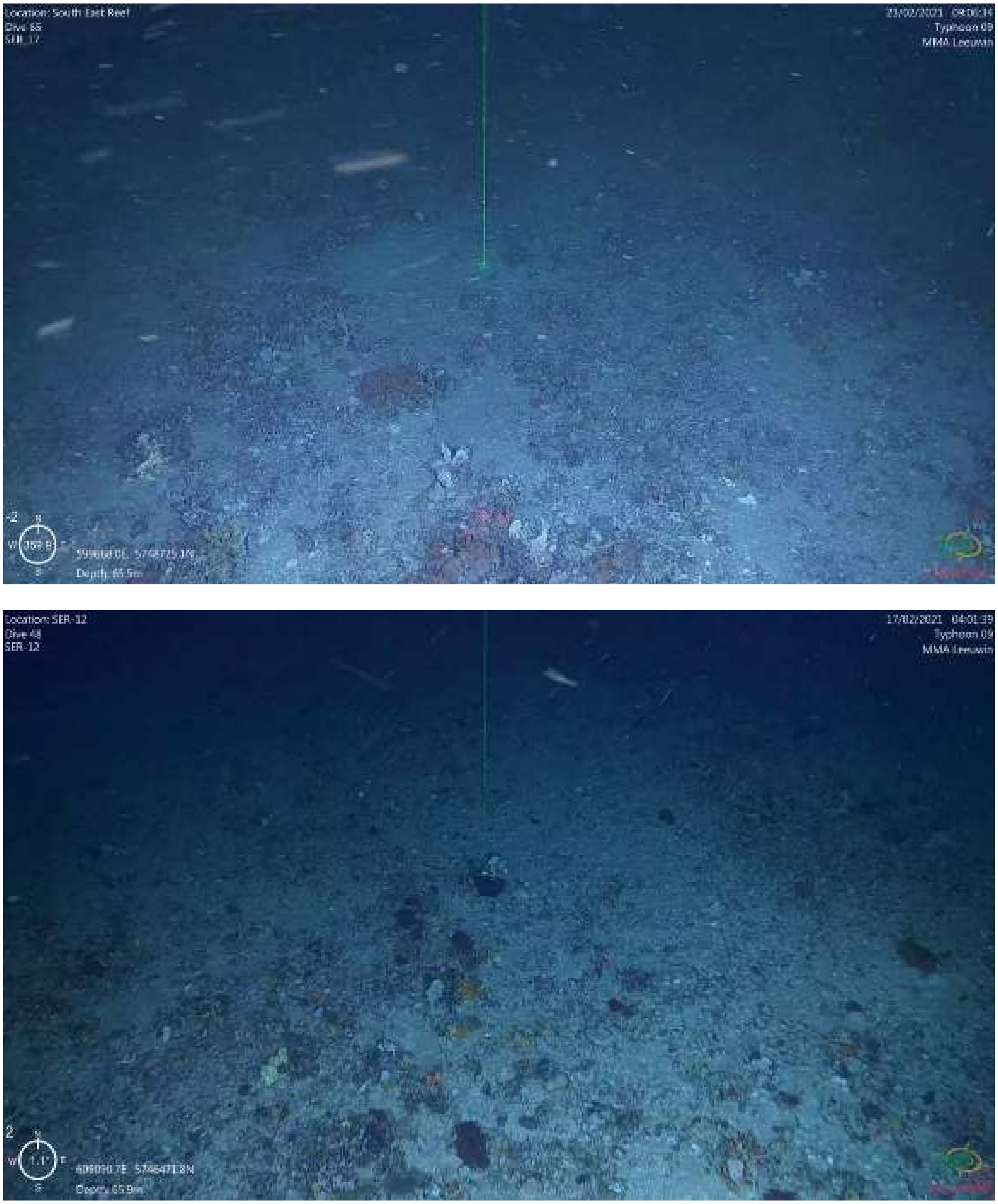
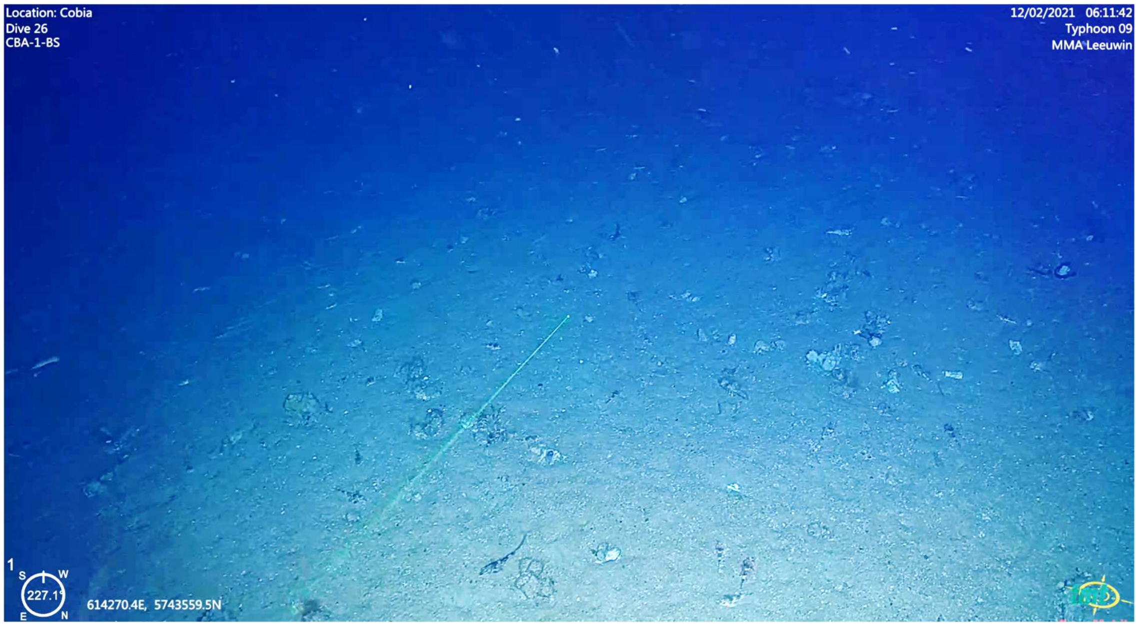


Figure 8-68 A natural reef area (South East Reef) observed during Environmental Survey 1 (Summer)

Figure 8-69 Reference sites recorded during Environmental Survey 1 (Summer)

Figure 8-70 to Figure 8-72 provide examples of the abundance of benthic fauna and fish assemblages observed at the SPJ structures in comparison to the benthic surrounds of the SPJs during Environmental Survey 1 (Summer). A full description of the marine flora and fauna observed around the SPJs during this survey is provided in Section 8.4.1-8.4.5.



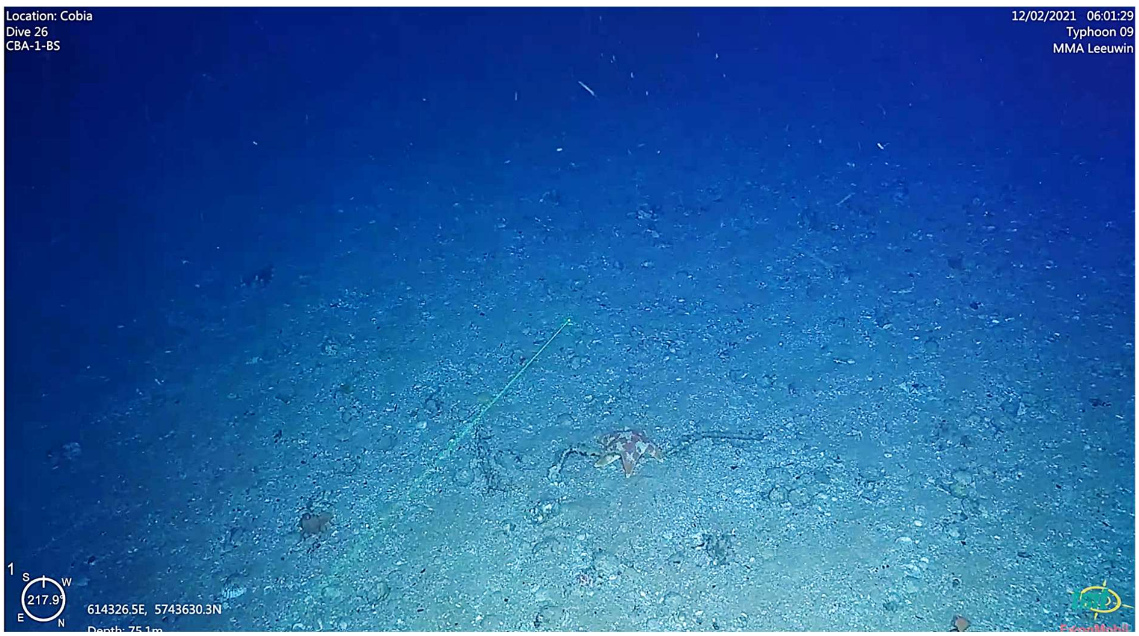


Figure 8-70 Marine flora and fauna observed at Cobia in water depths 73-75 metres (top 2 images) in comparison to benthic surrounds around Cobia (bottom 2 images)


Location: Halibut
Dive 05
HLA-1-BP
3/02/2021 10:09:36
Typhoon 09
MMA Leeuwin


3/02/2021 10:09:48
Typhoon 09
MMA Leeuwin

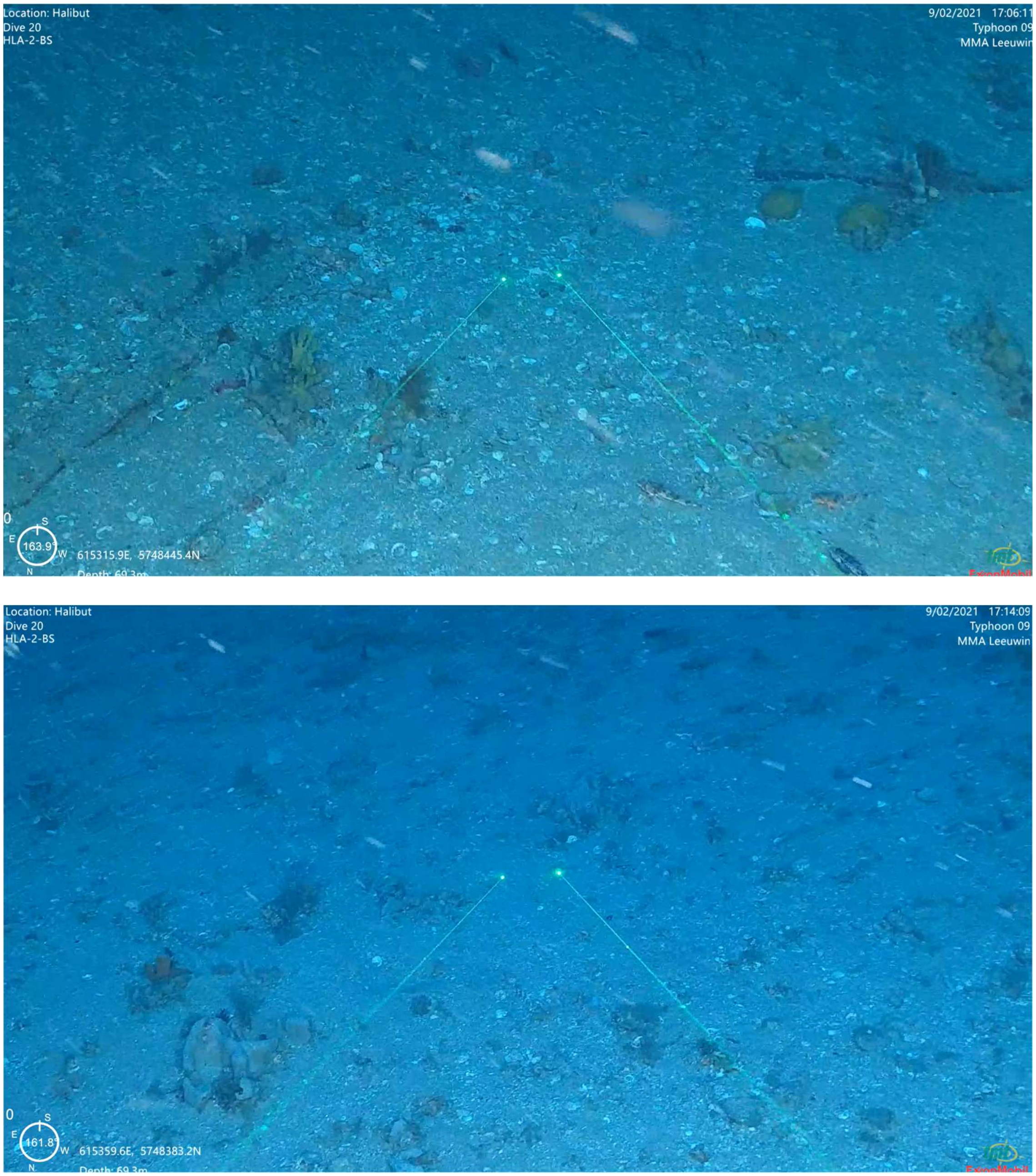
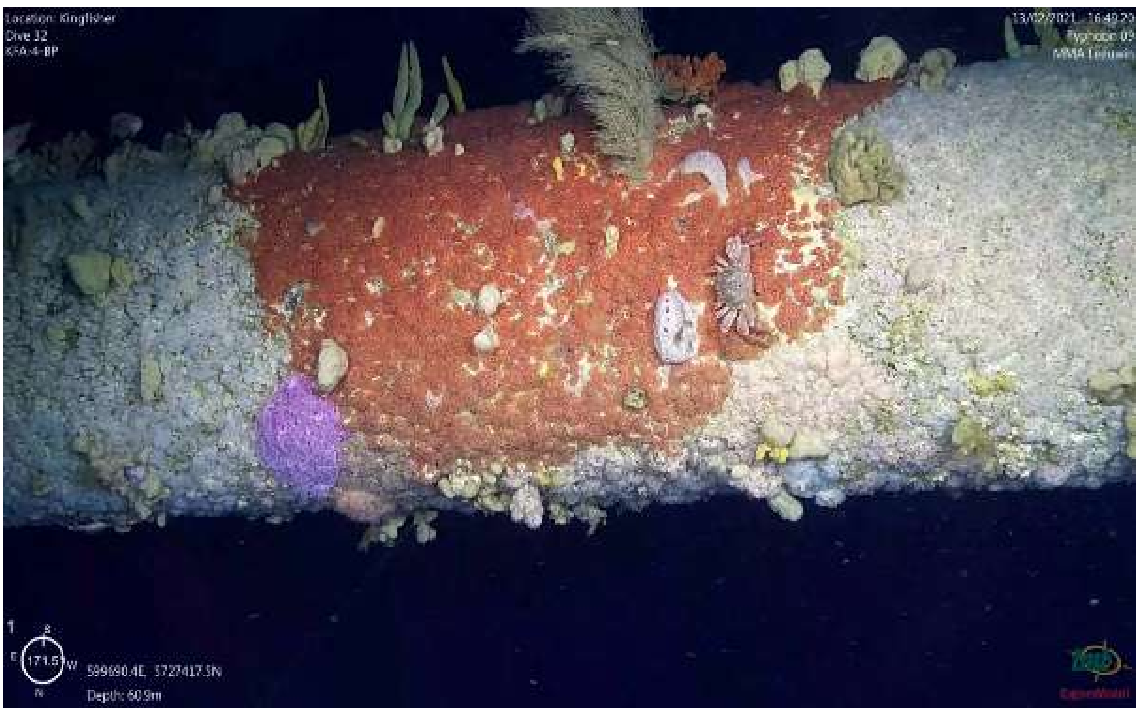
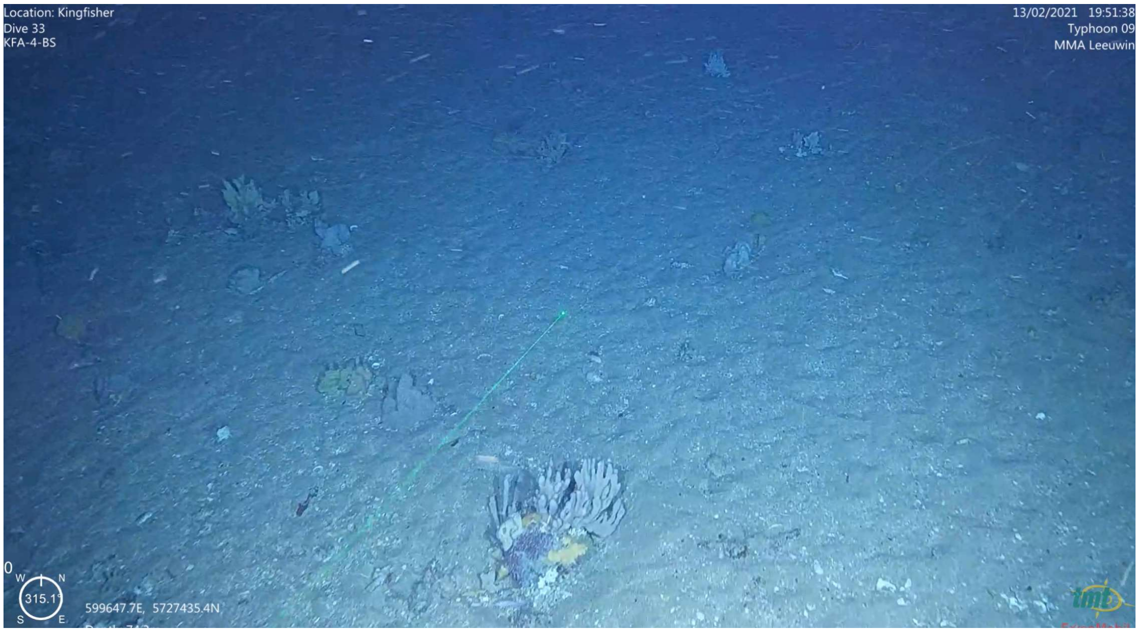


Figure 8-71 Marine flora and fauna observed at Halibut in water depths 69-70 metres (top 2 images) compared to the benthic surrounds around Halibut (bottom 2 images)


Location: Kingfisher
Dive 36
KFA-5-BP
14/02/2021 11:53:25
Typhoon 09
MMA Leeuwin
100.2°
601675.9E, 5726043.7N
Depth: 70.7m
ExxonMobil


Location: Kingfisher
Dive 32
KFA-4-BP
13/02/2021 16:49:23
Typhoon 09
MMA Leeuwin
171.5°
599690.4E, 5727417.5N
Depth: 60.9m



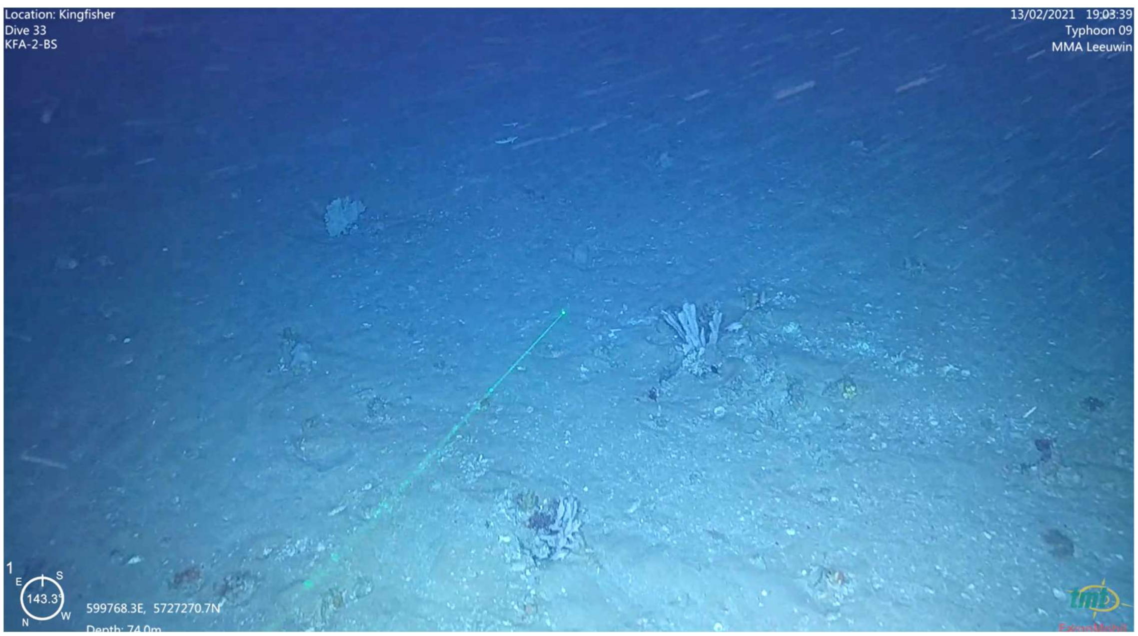


Figure 8-72 Marine flora and fauna observed at Kingfish A in water depths 60-74 metres (top 2 images) compared to benthic surrounds around Kingfish A (bottom 2 images)

In terms of species composition, the results of Environmental Survey 1 (Summer) demonstrated that the SPJs surveyed had a very high density of biota and were far more complex in terms of three-dimensional epibenthic structure than those observed at the reference sites in Bass Strait and at the nearby South East Reef (AIMS, 2022a). Fish observations recorded for Environmental Survey 1 (Summer) are summarised in Appendix E.

Fish assemblages observed on the SPJs were also markedly different to those in surrounding natural ecosystems of the Bass Strait, with many reef-associated and schooling species observed on SPJs, while a prevalence of sand-affiliated species were observed in natural ecosystems (AIMS, 2022a).

The review of historical ROV footage observed that the two SPJs studied in detail (WKF and KFB) were covered in benthic biota, including encrusting ascidians, jewel anemone and sponges and 55 fish species were identified (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b). The highest overall species richness (the number of species) was found in the deepest depth bands (greater than 60 metres) on the two SPJs. This was also evident during Environmental Survey 1 (Summer), in which it was observed that the majority of the taxonomic richness was from fish which live or feed in the demersal zone (near the seabed). Due to differences in sampling effort (less transects at the reference sites) during Environmental Survey 1 (Summer), the data did not allow for statistical comparisons of species richness between reference sites, South East Reef and the SPJs, however low abundances of all fish species were observed at reference sites (AIMS, 2022a). A repeat offshore environmental survey scheduled for winter 2022 will provide further data to allow the assessment of species richness at reference sites and South East Reef, in comparison to the SPJs depth categories.

A study on the conservation values of Bass Strait sponge beds was undertaken in 2002 (Butler, Althaus, Furlani, & Ridgway, 2002) and concluded that based on the evidence, sponge beds in southern Bass Strait may have biodiversity values that are particularly worthy of protection from processes that may disturb benthic assemblages (Butler, Althaus, Furlani, & Ridgway, 2002). Sponges were seen to be the dominant benthic community at the base of the SPJ structures and were present in a variety of complex and erect morphologies at 25-60 percent cover, depending on the SPJ (AIMS, 2022a). Due to their position on the vertical profile, these sponges would be retained under the -55-metre end state for applicable SPJs.

Understanding seasonal variability in the richness and abundance of the species observed on and around the structures is important as assemblages may change seasonally (Schläppy, Robinson, Camilieri-Asch V, & Miller, 2021). A repeat offshore survey is being planned in winter 2022 (Environmental Survey 2 (Winter)) with the scope of this survey consistent with Environmental Survey 1 (Summer) with visual surveys of SPJs, reference sites and South East Reef locations being undertaken. The winter survey will provide information on seasonal variability in species assemblages and confirm the assumption that seasonality does not change the impact, risk and EOBO options assessed in this EP

It is clear from the observations made during Environmental Survey 1 (Summer) and the review of historical ROV footage that the SPJs are supporting a diverse ‘novel’ ecosystem. The structures are the dominant underwater hard substrate in the area, hence providing a novel habitat for marine species and supporting foraging habitat for protected species such as the Australian fur seal, which was frequently seen in footage and is known to forage around the structures (Arnould, et al., 2015).

Complete removal of the SPJs to the seabed (Option D as described in Section 3) will result in the complete loss of the encrusting biota on the structures and the flow-on effects of such removal to the marine communities that remain would likely be significant (AIMS, 2022a). While partial removal of the structures will result in the loss of sessile biota on the upper sections of the jackets, the remaining structure will retain the species richness and diversity associated with the lower sections, which was noted to be highest in the deepest depth bands. The retention of the lower sections of the jackets in place (and potential seabed placement of the removed jacket sections where applicable) will continue to require exclusion of bottom trawling commercial fishing activities from the immediate infrastructure footprint, hence retaining the fishery excluded areas which have been in place since the SPJ structures were installed. The SPJs in Bass Strait are the oldest Australian oil and gas structures and marine communities studied to-date (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2021b) and potentially the oldest offshore ‘no-take’ areas in Bass Strait since fishing is excluded (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2022).

The SPJs may have flow-on effects in supporting local commercial fisheries by providing 'nursery areas' for fish to reproduce and shelter, habitat and food sources. To investigate the potential overlap of species observed on the SPJs with those fished commercially in Bass Strait, a review of historical ROV imagery taken at WKF and KFB was undertaken and compared with reported commercial fishery data (fished species) from Bass Strait (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2022). Based on this coarse level analysis, in terms of direct overlap with the fisheries target species, the two SPJs studied did not appear to be supporting significant volumes of fishing target species. However, it was concluded that the SPJs may provide holistic benefits to the neighbouring ecosystem by supporting abundant lower trophic level species and critical habitat for fish where comparable habitats would be few and far between. This is demonstrated by the pervasive fishing effort throughout the oil and gas structures for the period studied (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2022). The observed presence of jellyfish, krill and pyrosomes around the SPJs were noted as key diet items for South-east Australian fishery species (Sih T. , Cure, Yilmaz, Macreadie, & McLean, 2022).

8.4.6.2 Productivity

There is ongoing debate as to whether offshore infrastructure simply attracts individual fish species, or provides habitat to increase the production of fish resources (productivity) – with much of the recent research suggesting that it is a combination of both (Advisian, 2022).

Secondary production (the formation of new biomass) is an important pathway of energy flow through an ecosystem as it makes energy available to consumers, including humans (Bull & Love, 2019).

Research on secondary productivity has largely focused on fish and has shown, based on research in California, that oil platforms, per unit area of seabed, are likely to be among the most productive marine habitats – exceeding all surveyed natural habitats (Claisse, et al., Oil platforms off California are among the most productive marine fish habitats globally, 2014). The productivity of sessile biota (sponges, anemones, bryzoans and hydroids) associated with oil and gas facilities has not been as extensively studied, however through trophic linkages the secondary productivity of sessile biota supports productivity of species higher up in the food chain, including commercially important species (Rouse, Porter, & Wilding, 2019).

A plankton survey around nine of the Esso facilities (including Campaign #1 SPJs BMA, CBA, FTA, FLA, HLA and MKA) documented the presence of larval and early-stage juveniles of 55 fish taxa (Neira, 2005). The question of whether the SPJs constitute an important spawning area for fish was not able to be answered with data from this study. However the study made the point that given the limited availability of hard substrate habitats directly around the Bass Strait SPJs, it could be argued that they may provide suitable alternative settlement habitats for early juveniles of some species (Neira, 2005).

Quantitative analysis of fish and invertebrate assemblage dynamics in association with a North Sea oil and gas installation complex (Todd, Edward, Lavallina, & Macreadie, 2018) presents evidence that fish were using an oil and gas complex in the North Sea for production, through records of lumpfish attending to broods on the structure, implying that the complex may be producing fish and invertebrates, rather than simply acting as a site of attraction.

Research undertaken in California (Claisse, et al., 2015) concluded that partial removal of platforms (in this case removal of the structure from the sea surface down to 26 metre depth) would retain on average 86 percent of the secondary fish production, while complete removal would eliminate most of the secondary production. Partial removal would result in the loss of species which reside in the shallower sections of the platform structure – but these generally represented a small proportion of the fishes associated with these platforms (Claisse, et al., 2015). Deeper-dwelling demersal species are generally less affected. This suggests that in systems where demersal fishes are dominant the loss of secondary production caused by partial decommissioning is reduced (Sommer, et al., 2019). Visual observations from Environmental Survey 1 (Summer) concluded that while on the surveyed SPJ structures much of the fish biomass was composed of pelagic schooling species, the majority of the taxonomic richness was from demersal (living close to the seabed) fish (AIMS, 2022a).

Although conclusions of studies in other regions of the world (e.g. California) indicate that oil platforms produce fish at a rate greater than other marine habitats (Claisse, et al., 2015), these studies also indicate that productivity can vary between facilities, even between those located in the same region. Ecosystem services are defined as the benefits that people obtain from ecosystems (Millennium Ecosystem Assessment, 2005). It is important to recognize the importance the ecosystem service the SPJs likely provide to the broader Bass Strait fishery. Feedback received from relevant persons during the voluntary public comment period for this EP also stated that the benefits to aquatic species at a population level should be further supported/substantiated. In order to understand how the SPJs may be contributing to fish production in the Gippsland region of southeast Australia, Esso has commissioned a study to estimate fish production at the SPJs. A selection of fishery target species will be assessed using abundance and size data obtained from offshore Environmental Survey 1 (Summer) and Environmental Survey 2 (Winter). The study will also assess how much fish production might disperse or disappear from these areas if structures are removed (AIMS, 2022c). The study results are expected in second quarter 2023.

8.4.6.3 Connectivity

The SPJ structures have been shown to support diverse and multitrophic level marine biota. Information as to how these structures are expected to be interacting with broader ecological processes within the Bass Strait region will further support determination of the conservation value of this marine biota and the contribution of the novel habitats.

The value of biological assemblages on the SPJs is likely to be related to whether they are a source or sink of larvae that disperse to natural habitats and communities. This will be a function of their connection with other artificial structures and similar natural communities (Schläppy, Robinson, Camilieri-Asch V, & Miller, 2021). Ecological connectivity is defined as the movement of individuals and genes among ‘nodes’ – where nodes may represent sources and/or destinations (McLean, et al., 2022). Connectivity is a core process for sustaining and replenishing marine populations and communities (AIMS, 2022b). Larval production by reef fishes and invertebrates that spawn at offshore platforms can benefit regional populations if the young are able to survive through the dispersive phase and contribute to production in natural areas (Nishimoto, Simons, & Love, 2019). The distance and direction of larval dispersal is influenced by the physical processes within the marine environment, namely the ocean currents.

Oil and gas infrastructure, which is generally focussed around petroleum deposits, are thought to be unlikely to be ecologically isolated (Melbourne-Thomas, et al., 2021). Evidence of offshore infrastructure facilitating seascape connectivity exists for larvae and mobile adult invertebrates, fish and megafauna, including threatened and commercially important species (McLean, et al., 2022). A study undertaken in 2018 (Henry, et al., 2018) adopted a network approach to consider the role that oil and gas installations in the ocean could play in species conservation and enhancing resilience. The North Sea Basin was used to illustrate the potential for widespread dispersal of protected cold water coral species between anthropogenic (artificial) structures and natural ecosystems (Henry, et al., 2018). The study studied larval trajectories and data from selected jackets and illustrated the potential for some structures to contribute to the regional ecology and biodiversity of the North Sea ecosystem – platform corals had the potential to help ‘seed’ larvae to large areas and potentially recolonise areas of reef which had suffered from trawling damage (Henry, et al., 2018). One of the platforms which formed part of the study (the Murchison SPJ) had been decommissioned, with the jacket footings being left in place, and was deemed capable of still producing coral larvae (Henry, et al., 2018). Studies carried out in the Gulf of Mexico have also provided evidence that the oil and gas platforms in the northern Gulf of Mexico have facilitated the geographic expansion of coral in this region by serving as ‘islands’ that can enhance the dispersal of the coral species (Sammarco, Atchison, Boland, Sinclair, & Lirette, 2012).

Structures which have been in place for a long time (like the Campaign #1 SPJs) have undergone colonisation and succession, leading to the formation of diverse and stable communities (Melbourne-Thomas, et al., 2021). The results of the analysis of the visual data collected during Environmental Survey 1 (Summer) and the review of historical ROV footage provide evidence that this is the case for the Campaign #1 SPJs. As a consequence, such older platforms may be disproportionally valuable as sources of larvae/juveniles to neighbouring areas (Melbourne-Thomas, et al., 2021).

Connectivity between structures and natural features may not be of value however if the connectedness of the structures translates into the spread of invasive species. Some of the Campaign #1 SPJ’s have been in the marine environment for over 50 years. As discussed further in Section 9.4, there is no evidence to suggest the structures are harbouring invasive marine species or facilitating the spread of these species to natural environments by acting as ‘stepping stones’ across the marine environment.

There have been no negative impacts observed as a result of invasive species on or around the SPJs in the approximately 350 hours of video survey data collected during the Environmental Survey 1 (Summer) and reviewed by qualified marine scientists. As the SPJs have been in place for over 50 years, if any invasive species were present in sufficient numbers to pose a significant ecological risk, the impact from their presence should be apparent from the visual assessments undertaken.

Connectivity within the marine environment is driven by ocean conditions and the type and characteristics of the species present. Regional-scale, site-specific studies are desirable to supplement studies undertaken locally and globally and provide further insight into the impacts of partial or full removal of the SPJs on connectivity. The degree to which structures may be connected and are representing a positive or negative net environmental impact will vary by region and structure, and requires targeted investigation to determine the conditions and the extent to which structures may be influencing multi-species connectivity and ecological flows across these seascapes (AIMS, 2022b). Feedback received from relevant persons during the voluntary public comment period for this EP also stated that the benefits to aquatic species at a population level should be further supported/substantiated. Esso has commissioned a further study to improve the understanding of the SPJs as either settlement habitat or source populations for larvae of fishes and benthic organisms which utilise oceanic currents for dispersal and connectivity within the broader Gippsland region. The study will model the influence of habitat created by the SPJs for population connectivity of selected marine biota. A biological-physical modelling approach will be taken which will estimate species-specific connectivity between natural reef habitats and the SPJs. Through this, the influence the SPJs may have on population connectivity can be estimated and evaluated further.

8.4.6.4 Ecosystem health

As outlined in the preceding sections, decommissioning of the lower sections of the SPJs in place will result in some retention of the ecosystems established on the remaining structure near the mudline. These retained ecosystems will provide ongoing ecological service value through provision of habitat, foraging opportunities and safe havens from trawl fishing. The value of the retention of these ecosystems will be influenced by the 'health' of the biota present and the current and predicted future conditions of the habitat provided by the SPJs.

An ecosystem can be defined as a dynamic community comprising populations of plants, animals, microorganisms and the non-living environment interacting together as a functional unit (DEWHA, 2009b).

The following metrics are considered indicators of a 'healthy' ecosystem:

- level of species abundance, diversity and richness present
- representation of multiple ecosystem trophic levels (e.g. from primary producers such as plants up to apex predators)
- presence of different life stages of species (indicating reproduction and productivity)
- absence and influence of introduced invasive marine species (IMS)
- quality of the habitat (water quality, sediment quality, presence of contaminants).

These indicators of a healthy ecosystem and how they apply to the SPJs are described in detail in the following Sections 8.4.6.4.1 to 8.4.6.4.3.

A review undertaken by (Tett, et al., 2013) defined 'good ecosystem health' as:

"the condition of a system that is self-maintaining, vigorous, resilient to externally imposed pressures, and able to sustain services to humans (ecosystem services). It contains healthy organisms and populations, and adequate functional diversity and functional response diversity. All expected trophic levels are present and well interconnected, and there is good spatial connectivity amongst subsystems."

This section provides an assessment of the health of the ecosystems around the Campaign #1 SPJs, based on evidence from literature and Gippsland Basin-specific studies.

8.4.6.4.1 Level of species abundance, diversity and richness present

A summary of the fish abundance and richness observed during Environmental Survey 1 (Summer) is presented in Figure 8-73. It can be seen from this data that the abundance and richness associated with the SPJs is comparable or higher than that observed at the natural reef and reference sites (located away from any influences of the SPJ operations or other infrastructure).

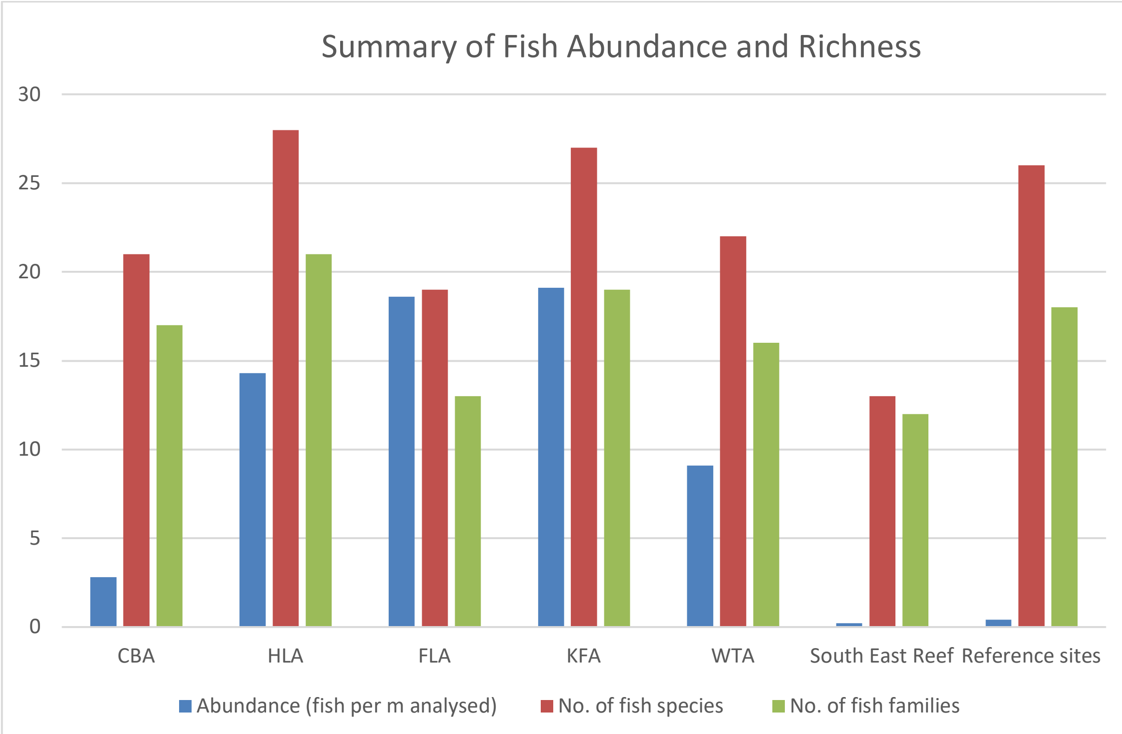


Figure 8-73 Summary of fish abundance and richness

WTA ceased production in 1997, KFA in 2019 and FLA in 2020. Comparing the fish abundance and richness observed at these three non-producing SPJs with those observed at the SPJs still producing (CBA and HLA) may provide an indication of any potential differences on these metrics as a result of aspects of ongoing production operations such as discharges (food waste, sewage, produced formation water), heat, light and noise which may have the potential to impact the fish abundance and richness in the vicinity of the SPJs. It can be seen from Figure 8-73 that there is no obvious trend in abundance or species richness across the SPJs relating to the current status of production or length of time the SPJ has been in CoP. This is however difficult to directly compare due to confounding factors such as water depth, location and age of the structure, which vary across the SPJs.

8.4.6.4.2 Presence of ecosystem trophic levels

The trophic level of an organism refers to the position it occupies in the food chain. A healthy functioning ecosystem will contain interconnected species from multiple trophic levels, starting with primary producers (such as algae which convert light from the sun to biomass), then herbivores, carnivores and finally apex predators.

Opportunistic sampling of plankton undertaken around nine of the Esso offshore platforms in 1998/1999 (including Campaign #1 SPJs BMA, CBA, FTA, FLA, HLA and MKA) by (Neira, 2005) identified the presence of larval and juvenile fish of 55 taxa representing 45 different fish families. Similarly Environmental Survey 1 (Summer) identified fish from 49 taxa representing 30 families on or near the SPJs sampled. Fish were observed across multiple feeding 'guilds' (groups which represent the diet and life stage of fish) as identified in *A feeding guild indicator to assess environmental change impacts on marine ecosystem structure and functioning* (Thompson, et al., 2020), including 'zooplanktivores' (fish which tend to feed on zooplankton), 'piscivores' (fish which feed on other fish), algae/invertebrate consumers and invertebrate/generalist carnivores. In terms of benthic communities observed, those present included macroalgae, many groups of sponges, cnidaria (primarily jewel anemone), crabs, southern rock lobster and bryozoan (AIMS, 2022a). A study on seals in Bass Strait (Arnould, et al., 2015) found evidence that oil and gas infrastructure in the area had become foraging habitat for Australian fur seals, a finding that is supported by the observation of many seals foraging around the SPJ structures in the review of historical ROV footage (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b) and Environmental Survey 1 (Summer) (AIMS, 2022a). Other predators such as a white shark, Port Jackson sharks and larger fish such as trevally were observed, while evidence of reproduction in the form of a draughtboard shark egg case attached to a sponge on the base of WTA was noted.

Observations from these studies provide evidence that the ecosystems present on or around the SPJs exhibit the presence of multiple trophic levels and the presence of different life stages. The analysis from Environmental Survey 1 (Summer) showed that platforms surveyed are providing habitat for diverse fish communities and the fish assemblages observed on the platforms are unique for this offshore region of the Bass Strait and likely play an important role in the functioning of food webs in the area with representation of diverse trophic levels (AIMS, 2022a).

As discussed in Section 9.4.3, no IMS were observed on any of the SPJs during Environmental Survey 1 (Summer) or the review of the historical ROV footage.

8.4.6.4.3 Quality of the habitat - water, sediment, contaminants

Contaminants associated with oil and gas infrastructure may influence the quality and/or value of the infrastructure as habitat by:

- reducing the productivity of fish communities
- altering the species composition found at the sites, or
- reducing the perceived or actual safety of the area for collecting fish or other types of seafood for human consumption (Melbourne-Thomas, et al., 2021).

Sediment samples were collected around Campaign #1 SPJs WTA, KFA, CBA, HLA and FLA during Environmental Survey 1 (Summer). The results of this analysis are presented in Section 5.3.3. In summary, whereas there were some instances where concentrations of metals or occasionally PAHs exceeded screening levels (refer section 5.3.3), over 95% of samples returned concentrations below screening levels, indicating that the overall level of contamination is low and this is unlikely to cause environmental impact based on screening values alone. Analyses of the sediments from Environmental Survey 2 (Winter) will provide information for the remaining Campaign #1 SPJs. Should the results of Environmental Survey 2 (Winter) return results that are not comparable to Environmental Survey 1 (Summer), then this assessment will be re-evaluated.

Comparing the growth rates of fish living around platforms with those on natural reefs is one method of contrasting the overall health and potential survival of these animals (Bull & Love, 2019). A study undertaken in California compared the daily growth rates of 'young of the year' blue rockfish living around three platforms and three natural outcrops. The results of the comparisons found that the rockfish associated with the platforms grew as quickly and as well as those from natural reefs, and may, in some instances, grow faster at platforms (Love, et al., 2006) (Love, Brothers, Schroeder, & Lenarz, 2007).

The mean lengths of four selected fishery target species observed from footage taken during Environmental Survey 1 (Summer) were measured from the stereo video imagery collected. The reef ocean perch was the only fish species noted in both SPJ locations as well as the natural reef (South East Reef). Using this species as a comparison, it can be seen from Figure 8-74 that there was no significant difference noted between the measured size of this fish species between the SPJ locations and the natural reef. As the reef ocean perch is a reef-associated species, there were too few individuals of this species observed at the reference sites, which were generally sandy areas, to allow these to be measured at reference locations.

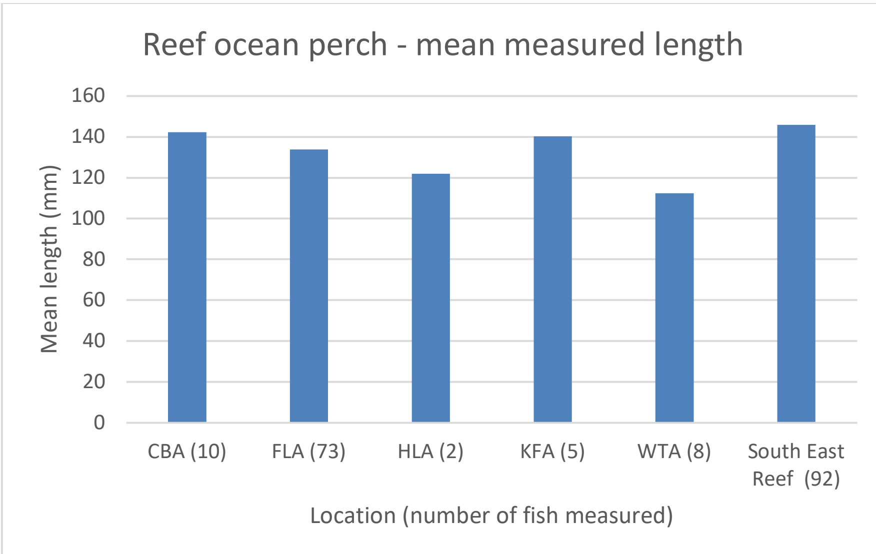


Figure 8-74 Mean measured length of reef ocean perch at surveyed locations (Environmental Survey 1 (Summer))

Based on the observations made during Environmental Survey 1 (Summer) and the review of historical ROV footage, there is no indication that the SPJs are currently supporting an unhealthy ecosystem. The video imagery collected and analysed shows a vibrant, diverse and rich collection of marine life almost entirely covering the SPJs. Further studies commissioned to estimate fish production and the degree of ecological connectivity between the SPJs (refer to Sections 8.4.6.2 and 8.4.6.3) will provide further understanding as to the health of the ecosystems on and around the SPJs.

With the exception of the jacket steel, grout and sacrificial anode constituents, which are discussed in Section 8.5, all contaminants associated with the SPJs such as coatings, tanks or skimmer piles which may contain residual hydrocarbons will be removed from the marine environment during decommissioning execution.

8.4.6.5 Changes to ecological value as a result of removal of upper sections of jackets

Removal of the top sections of the SPJs may result in more light reaching the deeper sections of the SPJs, depending on the depth of water the SPJ is located in, which may alter the composition of benthic communities that exist there (i.e. sponges, anemones). The benthic communities present on the top sections of the SPJs that are removed and taken onshore for dismantling and disposal will be completely lost, as this ‘marine growth’ will be removed prior to the components being recycled or disposed of. A minimal quantity of marine growth may be dislodged into the offshore environment during cutting of the structure and removals. The option to place some upper sections of the SPJs adjacent to the lower sections remaining in place is expected to mitigate some of these impacts through providing additional hard substrate habitat for marine growth. Attached sessile biota unable to survive the transfer to a deeper location at the time of placement will form food for demersal species in the area. The nature and composition of the marine growth on the placed sections will change as the placed sections are progressively colonised by organisms more suited to the conditions at the placement depth.

Removal of the upper sections of the SPJs is also likely to result in a reduction of the abundance of fish species that were observed to be predominantly present in the shallower sections of the SPJs, such as anchovies and scad, which are both commercial fishery target species and prey for pelagic fishes and marine mammals such as Australian fur seals (AIMS, 2022a).

While the removal of the upper sections of the SPJs will result in some impact to the benthic communities and fish species associated with the SPJs, this impact is unavoidable to ensure international standards and the safety of navigation are met (per IMO Standard 3.6 (IMO Res. A.672(16), 1989)). The lower sections of the SPJs were observed to possess the most abundant and diverse array of sponges and the highest species richness of fish compared to the upper sections (AIMS, 2022a). Retention of these lower sections is proposed to allow the SPJs to continue to enhance the ecological richness and diversity of the area, while also balancing the ongoing needs of other users of the sea.

8.4.7 Changes to biodiversity and habitat over time due to jacket degradation

The degradation study undertaken for the SPJs (Kent Plc, 2022) included a ‘shipwreck’ study, which predicted the footprint when the remaining SPJ sections collapse. Impacts from material degradation are discussed in more detail in Section 8.5 of this EP.

The SPJs are predicted to slowly degrade in the marine environment over the next 300-1200 years (Kent Plc, 2022) and the SPJ sections remaining in place would eventually fail and collapse over time. This may have physical (disturbance, removal/creation of habitat) and ecological (changes in biodiversity, structures of communities) impacts. An Environmental Impact Assessment was undertaken in 2022 to assess the impacts on the marine environment, over time, as a result of the degradation of the SPJs (RSK in (Kent Plc, 2022)). This Section has been informed by the results of this study.

The assessment by (Kent Plc, 2022), determined that under the proposed end states, the remaining SPJs are predicted to collapse within the existing SPJ footprint due to the proximity to the seabed of the lower jacket sections and the inward batter of the SPJ structure. The remaining SPJ profile in the water column is not subjected to high levels of environmental loading (waves, currents) which may cause the structure to fall to one side. The SPJ will rather collapse in on itself, influenced by the inward battered configuration. If the collapse happened instantaneously or a piece of the SPJ falls, the existing seabed biological habitat and biota within the predicted footprint would be smothered. In addition, any biota living on parts of the structure may be buried or crushed. However, the collapse is more likely to occur slowly, or jacket members could fall onto other sections, which would have little effect on the existing environment as the flora and fauna would adapt to the changing structure over time. (RSK in (Kent Plc, 2022)).

Upon degradation, the SPJ sections remaining in place will provide additional hard substrate in the predominantly sandy habitat on the seabed. This is expected to enhance biodiversity there based on that which has developed over time and can be seen on the SPJs today.

None of the calculated concentrations of the chemical constituents of steel (i.e. iron, manganese, chromium etc.) that will be released by corrosion of the SPJs as they degrade were found to exceed the water quality trigger values at 1 centimetre from the SPJs, which indicates that the structures pose low to negligible risk to the biological receptors in the area (refer to Section 8.5). This suggests that there will be no acute (short term) toxic effects on the marine biota, either to the sessile organisms or to the pelagic fauna associated with the SPJs (RSK in (Kent Plc, 2022)). It was also assessed that it is of low to negligible likelihood that the concentrations of steel constituents (i.e. predominantly iron) leaching from the SPJs will cause chronic (long-term) negative (toxic) consequences to either sessile or pelagic species associated with the SPJs (RSK in (Kent Plc, 2022)). As such, changes in biodiversity over time as a result of impacts from the dissolution of the SPJ components is not expected.

8.4.7.1 Habitat augmentation – placement of selected upper sections of the jacket on the seabed

The impacts to marine biota as a result of the potential placement of removed sections of HLA, CBA, MKA, KFA, KFB, WKF and FLA may include:

- certain species of encrusting marine biota present on the SPJ structure may be lost due to requirement for habitat conditions (light/nutrients) which may not be present in deeper water
- fish species which require certain conditions found in the sections of SPJ closer to the surface will be unlikely to migrate to the placed sections of SPJ in deeper water and hence would experience a change in habitat/behaviour
- seabed placement is expected to mitigate some of the habitat reduction bought about as a result of the removal of the top sections of jacket.

On both natural and artificial reefs, habitat complexity is known to be positively correlated with the diversity and abundance of species (Rouse, Porter, & Wilding, 2019). That is, the more complexity available in substrate, the more diversity and abundance of biota is to be expected. The placement of upper jacket sections adjacent to the lower sections will result in additional hard substrate on the seabed for recolonisation by sessile biota (if some species are lost during relocation) and creation of habitat for mobile species such as demersal fish. Seabed placement is expected to mitigate some of the habitat reduction bought about by removal of the top sections of jacket, as over time, it is expected that benthic communities colonising the structure that is placed on the seabed may be colonised by communities presently observed in the base region of SPJs (AIMS, 2022a).

This is expected to further increase the ecological and environment value of retaining the lower sections of the SPJs.

If partial or full loss of encrusting biota occurred as a result of the relocation of upper sections of jackets to deeper water depths or some marine biota is lost via smothering when the SPJ sections are placed on the seabed, recolonisation of the placed sections over time would occur with other sessile and epibenthic species. Adjacent placement increases the availability of habitat to sponges and demersal fish species. Colonising benthic communities that persist on the adjacent placed sections would be those able to recover from the physical disturbance associated with removal and those able to tolerate the increased depth compared to their original location (lower light, temperature, currents). Light dependent photosynthetic macroalgal species would be completely lost, however this will also occur if the upper sections of jacket are removed for disposal of onshore.

Species richness and biota cover may not be as high on adjacent placed sections in the absence of height/structure above that likely drives shifts in productivity and detrital flows to deeper sections. However, the provision of additional hard substrate in sand-dominated regions supports a greater diversity, cover and height of benthos and vastly different fish communities (AIMS, 2022a).

8.4.8 Consequence evaluation

In summary:

- The Campaign #1 SPJs are supporting extensive thriving ecosystems which are likely contributing to the richness and diversity of the ecosystems in the Bass Strait region. The SPJs are almost completely covered in marine life, including anemones, crustaceans, sponges, algae, bivalves and barnacles which in turn provide habitat and food for many fish species and Australian fur seals.
- The SPJs may be considered as 'novel ecosystems' as the benthic and fish communities supported have been shown to be distinct from those that occur on the surrounding seabed and at a nearby natural reef location. The results of the many rigs-to-reefs programs from around the world support the expectation that the SPJs will continue to act as novel ecosystems over time, even once oil and gas production has ceased.
- The SPJs are unique due to their long-term (over 50 years) provision of hard substrate in the Bass Strait marine environment, which consists predominantly of sandy sediments.
- Retention of the lower sections of the SPJs will allow for the continuation of the 'de facto' marine protected areas that have developed around the SPJs in the absence of commercial fishing activities from the area by virtue of the presence of PSZs. Commercial fishing activities involving bottom trawling will continue to be excluded from the footprint of the lower sections of the SPJs due to the risk of snagging.
- Decommissioning of the lower sections of the SPJs in place will result in the retention of the species richness, abundance and extensive habitats observed at these depths. Species richness and diversity was observed to be highest at the deeper depths of the SPJs.
- Removal of the upper sections of the SPJs for onshore disposal will result in the removal of the encrusting biota present on these sections of the SPJ and a change in habitat for mobile species such as fish which rely on the environmental conditions associated with the upper sections of the SPJ.
- As the degradation of the structures in the marine environment will occur very slowly, little effect on the existing environment is expected as the marine flora and fauna would adapt to the changing structure over time.
- The option to place some removed upper sections of selected SPJs adjacent to the lower sections is anticipated to mitigate some of the habitat reduction bought about by the option of removing the upper sections and transporting all of these onshore for dismantling and disposal. Over time, it is expected that sections placed on the seabed would be colonised with those species presently observed in the lower sections of the SPJs.

The impacts on marine biota of partial removal of the SPJs to 55 metres below MSL for eight of the SPJs are expected to be minor to identified receptors. The effects of removal of the upper sections, which will either be transported onshore for disposal or placed adjacent to the lower sections on marine biota are expected to be localised and of low to moderate intensity, resulting in a **Consequence Level III (minor)**(refer to Section 7.4 for a description of Consequence Levels).

The impacts to marine biota of removal to as close to the seabed as practicable for two of the SPJ structures (WTA and BMA) are expected to be **minor** to identified marine biota receptors. While the removal of the majority of the SPJ will result in the loss of the benthic biota present and the loss of habitat for mobile species such as fish and foraging opportunities for seals, effects are localised to the two SPJ locations and of low to moderate intensity, resulting in a **Consequence Level III (minor)**.

An assessment of the positive environmental impacts of retaining the lower sections of the SPJs in place is not supported by the impacts and risks assessment methodology, as risk assessment is by definition focused on impacts and risks with negative consequences. As discussed in Section 8.4.6, the ecological value of retaining the lower sections of the SPJs is considered to be significant. Feedback received from two relevant persons during the public comment period indicated support for retaining the ecosystems which have developed around the facilities.

8.4.9 Controls to minimise impacts to marine biota as a result of the Steel Piled Jacket end states

Good practice controls and demonstration of ALARP and acceptability are presented in Table 8-9, Table 8-10 and Table 8-11.

Table 8-9 Good practice controls

Good practice	Adopted	Control	Rationale
None identified.			

8.4.10 Demonstration of As Low As Reasonably Practicable

Table 8-10 As Low As Reasonably Practicable demonstration

ALARP decision context and justification	Decision Context B Esso believes ALARP Decision Context B should apply as: • the activity of leaving sections of SPJs partially in place is a non-standard activity in Bass Strait • there is some uncertainty in the impacts and benefits, which is being addressed by further studies as discussed in Section 8.4.6 • there is some partner interest and some persons may object. An Engineering risk assessment has been undertaken to assess the costs and benefits associated with additional, alternative and/or improved controls to ensure impacts to marine biota as a result of the SPJs remaining in place are reduced to ALARP.		
Engineering risk assessment			
Additional, alternative, improved controls	**Benefit**	**Cost/feasibility**	**Adopted**
Retain all of the SPJs in the water column.	Maximum retention of the SPJs would ensure minimum disturbance to biota and minimum loss of current ecological value.	The retention of all or more of the upper sections of the jacket (above -55 m depth) was not assessed as acceptable during the	Not adopted

Additional, alternative, improved controls	Benefit	Cost/feasibility	Adopted
		Decommissioning Options Assessment (refer to Section 3.4).	
Install additional structures to augment SPJ lower sections remaining in place.	Integrating additional structures with the SPJ lower sections remaining in place may enhance the inherent ecological value they provide (e.g. large colonising surface, vertical profile, hydrological influence), whilst adding to habitat complexity and variety to support target species. In the context of the SPJs within the scope of this EP, augmentation is not considered to provide significant incremental habitat value, given the distances from shore, the already complex structures of the SPJs and the water depths, which are likely to preclude extensive use by recreational fishing and diving.	Water depths, distances from shore and the likely scale mean the benefits of augmentation are unlikely to outweigh the costs required.	Not adopted
Install additional structures to augment existing infrastructure – adjacent placement of selected removed sections of jacket on the seabed.	Adjacent placement will provide additional hard substrate on the seabed without the need to manufacture modules from new materials. Existing structures support thriving communities	Placement may require additional cutting and vessel time however is feasible and has been included in this EP as an option for disposal of the removed sections of jacket.	Retain as option: Seabed placement is subject to further clarifications regarding equipment and removal methodology by potential removal contractors.
Undertake Environmental Survey 2 (Winter) to investigate if there are any significant seasonal or temporal variations in species	A further targeted field survey of representative SPJs, reference locations and a natural surrounding reef area will enable the	Feasible	Adopted **CM7**

Additional, alternative, improved controls	Benefit	Cost/feasibility	Adopted
assemblages, as compared to Environmental Survey 1 (Summer).	investigation of any seasonality related changes to species richness and abundance.		
Undertake a productivity study to further understand the contribution of the SPJs to secondary fish production in the Gippsland Basin.	Study will help to further understand and provide Gippsland Basin-specific information as to the impact of decommissioning (removal or retention) on the productivity of the SPJs.	Feasible	Adopted **CM9**
Undertake a connectivity study to further understand the role of the SPJs as settlement habitat or source population for larvae of fishes and benthic organisms which utilise currents for dispersal and connectivity within the Gippsland Basin.	Study will help to further understand and provide Gippsland Basin specific information as to the impact of decommissioning (removal or retention) on connectivity pathways for the SPJs, both individually and as a network.	Feasible	Adopted **CM8**

8.4.11 Demonstration of acceptability

Table 8-11 Demonstration of acceptability test

Factor	Demonstration criteria	Criteria met	Rationale
Impact Consequence Level	Impact is **Consequence Level III** or less.	✓	
Principles of ESD	No significant impacts to relevant receptors so that biological diversity and ecological integrity is conserved.	✓	Removal of the upper jacket structure will result in localised, and irreversible impact to the benthic communities on these jacket sections, resulting in a **Consequence Level III**. This impact is limited in extent (i.e. localised) and is not considered likely to significantly affect biological diversity and ecological integrity of the region.

Factor	Demonstration criteria	Criteria met	Rationale
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	Partial removal of the SPJs is not considered to result in serious or irreversible environmental damage. The retention of the lower SPJ sections and potential seabed placement of removed sections is considered likely to mitigate any irreversible environmental damage that may result from the complete removal of the marine biota and habitats observed to be present on the SPJs.
Legislative and other requirements	Legislative and other requirements have been identified and met.	✓	Consistent with the OPGGS Act Section 572(7), this EP is seeking a “deviation” from the expectations of full removal per Section 573(3).
Internal context	Consistent with Esso’s Environment Policy (Appendix B).	✓	Proposed activities are consistent with Esso’s Environment Policy (Appendix B), in particular, to “comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist”.
	Meets *Project Environmental Standards* (ExxonMobil, 2021b).	✓	The Environmental Standard do not specifically address the decommissioning of offshore infrastructure. however the activity meets the intent of the *Project Environmental Standards* (ExxonMobil, 2021b).
	Meets ExxonMobil OIMS objectives.	✓	Proposed activities meet OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements.
External context	Relevant person feedback has been considered during preparation of the EP.	✓	AMSA questions regarding the impacts to marine biota as a result of retaining the SPJs in place rather than removing them were answered during consultation. Feedback was received from two relevant persons during the public comment period which indicated support for retaining the

Factor	Demonstration criteria	Criteria met	Rationale
			ecosystems which have developed around the facilities.

8.5 Material degradation

8.5.1 Description

While this section details material degradation for SPJs that are proposed to be decommissioned as part of Campaign #1, during consultation with recreational fishers, concerns were raised that Esso offshore infrastructure was falling down or unsafe. Esso explained to the recreational fishers that SPJs and other infrastructure that continue to produce will continue to undergo maintenance and integrity programs to ensure that they are fit to continue operation.

SPJ platforms have a tubular jacket substructure that is anchored to the sea floor by steel piles. The piles are driven through the tubular legs of the jacket deep into the seabed to keep the structure in place. The jacket is braced by a complex array of horizontal, vertical and oblique tubular members extending around the perimeter and inside and across the jacket.

The proposed SPJ end states in this EP (as described in Section 4) would remove the upper sections of the SPJs. In the case of WTA and BMA, the proposed SPJ end state is removal of the jacket to as close as practicable to the seabed. For all other SPJs covered by this EP, the proposed SPJ end state is based on a cut line to achieve a minimum water clearance depth of 55 metres below MSL. An indicative representation of this for WKF is shown in Figure 8-75.

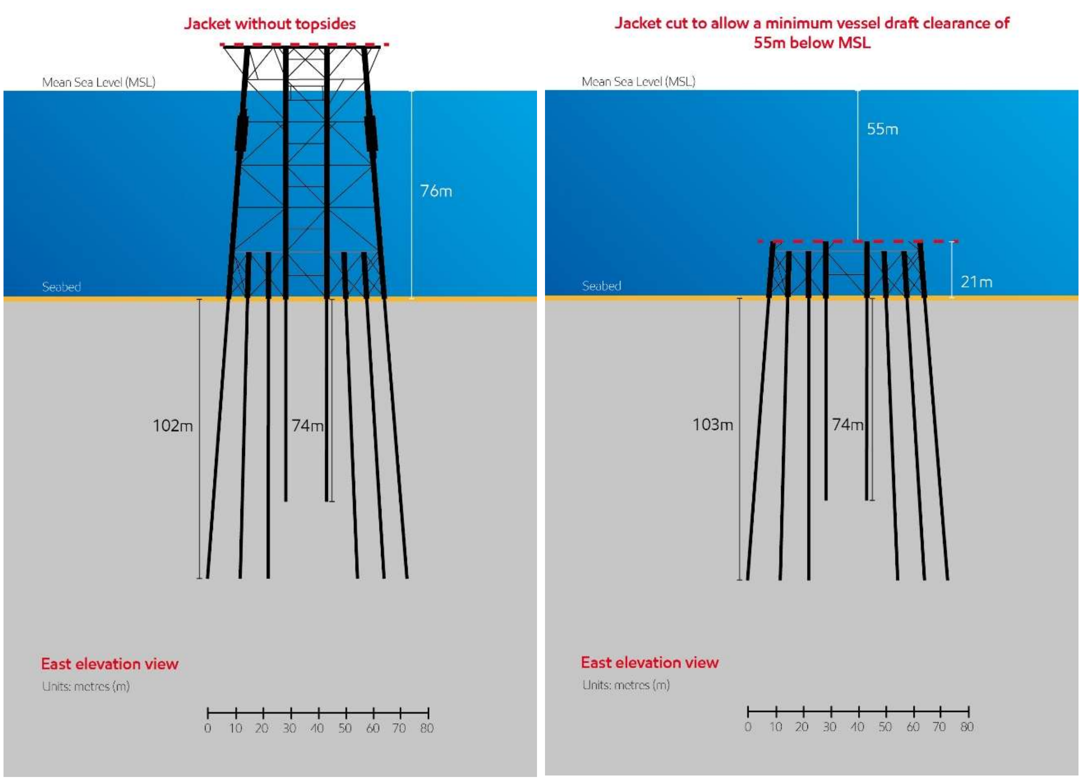


Figure 8-75 West Kingfish proposed end state example

By removing the upper sections of the SPJs, the splash zone 'monel' wraps, epoxy coatings boat fenders, ICCP cables and any former storage tanks (that may contain chemical residues) will be completely removed for onshore processing and disposal.

The remaining materials to be left in place are carbon steel (in the lower jacket and piles) along with cement grout (in the annulus between the jacket and piles), and any remaining sacrificial anodes. SPJ and grout annulus construction are discussed in Section 3.2.4.1. There is no mercury in the steel or the grout.

Sacrificial anodes are metal alloys that are attached to the SPJs to protect the main structure from corrosion. The metals used to create the sacrificial anodes are selected in order to have a stronger negative electrochemical potential than the metal it protects. The anode will be preferentially consumed in place of the metal it is protecting, which is why it is referred to as a "sacrificial" anode. Sacrificial anodes are widely distributed across the SPJs. There is no mercury in the anodes.

In order to assess the environmental impacts of leaving the lower sections of the SPJs in place a material degradation study was commissioned by Esso in 2021/2022. This study investigated the anticipated rate of degradation of the SPJ constituents in the marine environment (Kent Plc, 2022). The output of the material degradation studies was then used to inform an Environmental Impact Assessment to identify any potential environmental impacts associated with this degradation. This study has been used to inform this evaluation.

Table 8-12 outlines SPJ construction types and materials.

Table 8-12 SPJ construction types and material details

SPJ facility	Water depth (m)	Structure type	Corrosion protection system	Estimated height of remaining lower sections above seabed (m) used for materials degradation calculations
HLA	73	SPJ (sixteen legs) and strut	ICCP – no sacrificial anodes	18
KFA	77	SPJ (eight legs) and strut		22
KFB	78			23
MKA	93	SPJ (eight legs)	SACP with ICCP retrofit	37.7
WKF	76			21
CBA	78			23
FLA	93			38
FTA	69			14
BMA	59			3
WTA	54	SPJ (four legs)	SACP	3

MKA, WKF, CBA, FLA, FTA and BMA were all installed with SACP systems before a subsequent retrofit with an ICCP. Residual anodes associated with the initial SACP systems are expected to be in place on the jacket structures. Once the ICCP systems are disconnected, these residual anodes will reactivate until they are fully consumed. Once these anodes are fully consumed, the jacket steel will commence its degradation process.

Reported structural integrity anomalies such as weld defects, member thickness loss and/or physical damage were considered in the material degradation assessment. While the anomalies may accelerate local areas of failure, they are not deemed to be extensive or significant enough to change the outcome of the overall degradation on timeline. The study used available information to establish degradation rates for the various structural components. Technical references utilised by Kent Plc (2022) to establish corrosion rates for the varying structural components included:

- *Corrosion in Seawater* (ASM International, 2006)
- *Corrosion of metals and alloys in the deep ocean* (Reinhart, 1976)
- *Materials Selection* (NORSOK, 2014)
- *Long term degradation of offshore structures and pipelines: decommissioned and left in-situ* (OGUK, 2013b).

Those degradation rates were then used to establish the time to wall perforation and loss of overall structural integrity. The degradation rates were also used to estimate concentrations of dissolved metals resulting from degradation processes.

8.5.1.1 Material degradation study – Steel

All structural steel material used in the construction of the SPJs piles was assumed to be provided by BHP. In order to determine a steel composition, Australian Standard steel material codes AS A.149-1965 and AS A.157-1966 were reviewed based on the construction time frames and strength grades typical of SPJ structures. Information based on these codes was also aggregated with AS 1204 (1972) and AS 1205 (1972) based on a BHP Steel catalogue from 1974 that referenced those codes. The consolidated composition used in this study adopted the highest potential concentration of all identified elements in order to conservatively assess any potential environmental impacts.

These constituents and the estimated maximum mass of each element at the time of decommissioning are listed in Appendix A3 and Appendix A4 for the remaining above and below seabed portions of the structures respectively. It is noted that a result of adopting the highest potential concentration per element from a range of reference sources, the adopted weight percent values exceed 100 percent when summed.

Corrosion derived material loss was assessed in terms of resultant chemical to assess toxicity to the marine environment. It was conservatively assumed that all metal ions resulting from the corrosion process will be released to the seawater/sediment (i.e. none are captured scale/rust). It was also assumed that the metal dissolves with all compositional elements present in the immediate environment at the same relative concentration as in the solid metal.

The resultant concentrations of metal ions in seawater or sediment are influenced by a number of variables such as solubility of individual corrosion products, reaction of corrosion products with components in seawater, accumulation afforded by local geometry, effects of water currents, etc. In open seawater it is assumed that all corrosion products at the metal surface will be dispersed by the water movement, giving little opportunity to develop high concentrations. This forms the basis of a simplified model developed to derive conservative values of metal concentrations close to the metal surface allowing an assessment of their effects on marine receptors.

The model developed derived time-based concentrations for each metal ion component within a 1cm layer across a 1 metre-square area of metal surface to establish the maximum anticipated near surface concentration before the dissolved metals are dispersed. The concept of this model is illustrated in Figure 8-76 (Kent Plc, 2022).

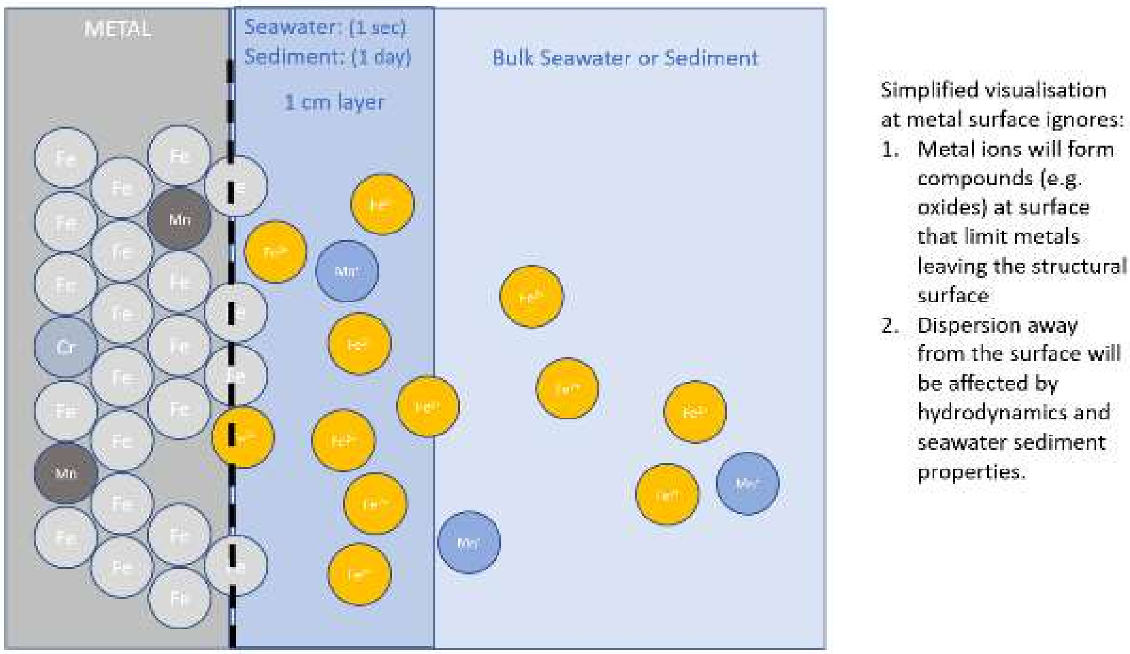


Figure 8-76 Schematic illustration of model used to derive element concentration at the steel surface in seawater and sediment

The following list describes the conservative assumptions that are incorporated into this model :

- The metal dissolves in seawater with all compositional elements present in seawater at same relative concentration as in the solid metal.
- Any compounds formed on the surface, e.g. as scale; oxides, hydroxides, sulphates, etc, do not reduce the concentration of compositional elements released to the seawater.
- The solubility of any compounds released to the seawater does not limit the concentration of compositional elements released to the seawater.
- The metal dissolves at calculated corrosion rate per unit surface area (kg/m^2/yr); where a range has been given the highest value is used.
- The metal dissolves for discrete time unit (1 second) whilst dissolved metal is accumulated.
- The accumulated dissolved metal is considered to remain within a limited layer of seawater (1cm layer over 1m^2) and the concentration of metal as ppb is given (kg metal/volume m^3)
- At end of time unit, the surface layer is assumed to be completely replenished with all the dissolved metals dispersed, hence the metal concentration does not increase further.

A number of long-term corrosion mechanisms were considered to determine applicable corrosion rates for the various structural components. Of all the mechanisms, direct exposure to open seawater produced the highest potential rate of corrosion of 0.1 millimetres per year with a potential for local pitting at a rate of 0.2 millimetres per year.

For the purpose of assessing dissolved concentrations, the upper corrosion rate of 0.1 millimetres per year was conservatively applied to determine a corresponding dissolved steel concentration of 2.49 parts per billion per second (Kent Plc, 2022). The concentration of the individual elements are assumed to be proportional to their concentration in the steel composition.

Table 8-13 summarises the calculated seawater and sediment concentrations from the degradation of the remaining SPJ constituents. It is noted that as a result of adopting the highest potential concentration per element from reference sources, the adopted weight percent values exceed 100 percent when summed. The rate of accumulation in the sediments was not calculated due to a number of poorly defined variables in the sediment porewater structure. It is likely that metal concentrations in the immediate vicinity of the SPJs will increase. The rate of increase and subsequent availability of deposited metals is subject to further studies in 2023. As described in Section 8.1, a revision to this EP will be undertaken should the results of the upcoming studies assess impacts and risks that differ from those presented in this EP.

Table 8-13 Calculated steel component concentration leached to seawater and sediment

Constituent	Weight (%)	Seawater calculated concentration (ppb (max)) 1cm from SPJ	Sediment calculated concentration (ppm) for 1 day interval in 1cm layer
Carbon	0.25	0.006	0.108
Chromium	1	0.025	0.430
Copper	0.45	0.011	0.194
Iron	98	2.439	42.153
Manganese	1.5	0.037	0.645
Nickel	0.5	0.012	0.215
Phosphorous	0.15	0.004	0.065
Silicon	0.7	0.017	0.301
Sulphur	0.04	0.001	0.017
Others	0.15	0.004	0.065
Aluminium	0.03	0.001	0.013
Niobium	0.03	0.001	0.013
Molybdenum	0.03	0.001	0.013

Constituent	Weight (%)	Seawater calculated concentration (ppb (max)) 1cm from SPJ	Sediment calculated concentration (ppm) for 1 day interval in 1cm layer
Vanadium	0.03	0.001	0.013
Titanium	0.03	0.001	0.013
Calcium	0.03	0.001	0.013
Cerium	0.03	0.001	0.013
Tin	0.03	0.001	0.013
Nitrogen	0.03	0.001	0.013
Boron	0.03	0.001	0.013

8.5.1.2 Material degradation study – Sacrificial anodes

Aluminium alloys for anodes are specifically formulated with “activation elements” to reduce the tendency to passivation enabling the anode to dissolve freely to supply current drawn by the steel being protected. ‘Passivation’ is a process where degradation products from the anode can form a stable outer layer that reduces further degradation and function of the anode. Common activation elements include indium, silicon or iron.

The sacrificial anodes installed on the SPJs included in this EP are aluminium-based indium activated alloy. The specific composition of anodes was not able to be confirmed from historical records so the relevant Australian codes from the time of construction of the jackets were used to derive an aggregated composition based on two potential anode types. The differences in composition were assessed to have no significant effect on the estimated depletion rates of residual anode mass. For the environmental assessment the greatest value of each compositional element from either anode type was conservatively adopted. The estimated maximum mass of remaining anode material and associated components are included in Appendix A5.

For the purpose of the material degradation study, it was assumed that:

- ten percent of the original anode mass of 134 kilogram per anode remains present (Reports suggest that there is likely to be less than 10 percent anode material remaining, so this assumption over-estimates the duration when anodes may continue to provide some protection. For MKA, it is reported that ICCP was installed in early life because sacrificial anodes were not operating. In this case it is assumed that 100 percent of original anode mass remains on the structure)
- anodes will reactivate when ICCP systems are disconnected
- anodes will provide cathodic protection to the steel until fully depleted
- current draw from remaining structure will be distributed evenly on all remaining anodes.

Table 8-14 summarises the calculated seawater concentrations derived from the degradation of the remaining anodes. It is noted that it was calculated that the remaining anodes would be fully depleted within approximately 2.5 years of the removal of cathodic protection systems.

Anodes are only located on the SPJs sections above the seabed, therefore only seawater concentrations have been calculated.

Table 8-14 Calculated anode component concentration leached to seawater

Constituent	Weight (%)	Seawater calculated concentration (ppb (max)) 1cm from SPJ
Aluminium	97.825	117.44
Cadmium	0.012	0.014
Copper	0.01	0.012
Iron	0.15	0.180
Indium	0.05	0.060
Magnesium	2.2	2.641
Silicon	0.2	0.240
Titanium	0.05	0.060
Zinc	5	6.003
Others	0.05	0.060

8.5.1.3 Material degradation study – Grout

The cement grout used for construction of piled jackets are typically made from ordinary Portland Cement mixed with a fine mineral aggregate such as sand, silica fume, pulverised fly ash, bentonite or barytes depending upon the required strength, density and shrinkage characteristics. As these are all naturally occurring minerals, progressive degradation and disintegration in a seawater environment is not expected to pose a risk to marine receptors.

Occasionally, other chemical additives are designed into the grout mix (e.g. set retarders, accelerators and non-shrink/expansion agents). Generally these are respectively lignins, calcium chloride, and aluminium powder. Of these only lignins are organic and would have been fully reacted in the body of grout shortly after placing and setting (Kent Plc, 2022). No residual toxicity is expected to remain from the potential addition of lignins at the time of construction.

Pile modifications were undertaken to increase the structural reliability for KFA, KFB and HLA by installing grouted insert piles (in approximately 1980), which likely used the same grout mix in the pile and insert pile annuli but with Ilmenite added, to provide the structural interface between the installed insert pile and existing piles. These are the only SPJ locations where Ilmenite is believed to have been used within the grout mix. Limenite is an iron-titanium oxide and is inert.

While contained within the original pile, or within the SPJ pile sleeve, grout will not substantially degrade (Kent Plc, 2022). Once integrity of the SPJ pile sleeve is breached by collapsing and falling members or at a cut point, the exposed grout plug will start to degrade and disintegrate from that point in time.

Table 8-15 summarises the estimated mass of grout remaining at each SPJ below and above the seabed based on the proposed end state option.

Table 8-15 Estimated remaining grout

SPJ	Estimated mass of grout remaining below seabed (MT)	Estimated mass of grout remaining above seabed (MT)
HLA	457	127
FTA	2097	259
CBA	2104	503
MKA	2001	502
KFA	667	92
KFB	664	92
WKF	1410	496
FLA	2231	587
BMA	830	183
WTA	400	22

8.5.1.4 Physical structure degradation

A 'shipwreck timeline' describes the degradation process and likely collapse mechanism of the SPJ lower sections over time. To define these timelines the following tasks were undertaken by Kent Plc as part of the degradation study:

- a screening study was undertaken to confirm the influence of hydrodynamic loading on the SPJs
- the potential collapse mechanism was predicted based on the SPJ type, material and hydrodynamic loading
- likely debris zone (i.e. the seabed area where the degrading SPJ material may accumulate) were predicted
- shipwreck timelines were derived for each SPJ by considering structural steel corrosion rates and potential collapse mechanisms.

The shipwreck timelines derived for the SPJs take account of jacket leg and brace wall thicknesses and steel grades. HLA and CBA were selected as representative SPJs to be assessed in detail. The timelines derived were applied to the remaining SPJs on the basis that differences between the jackets were unlikely to effect the overall timeline. WTA was considered separately given it is of a different structural design to the other SPJs (Kent Plc, 2022).

Figure 8-77 illustrates the derived typical 'shipwreck timeline' for a SPJ. In summary, the detailed assessment of the CBA, HLA and WTA SPJs identified that initial failure of small jacket components (supporting members) occur in the range of 50-100 years (Kent Plc, 2022). The jacket legs and skirt pile sleeves containing grout and insert piles will be the final components to breakdown. Overall degradation of the main steel parts of the SPJs was assessed to occur between 300-1200 years (Kent Plc, 2022). The 'collapsed' appearance of the SPJs at that stage is anticipated to largely consist of standing grouted pile sleeves and/or pile inserts within a mass of fallen, broken and corroding steel accumulated on the seabed. In the final shipwreck stage, the remaining steel and grout materials will breakdown into smaller lumps. The rate of collapse will gradually increase over time, refer Figure 8-78 (Kent Plc, 2022).

The assessment by Kent Plc, determined that under the proposed end states, the remaining SPJs are predicted to collapse within the existing SPJ footprint due to the proximity to the seabed of the lower jacket sections and the inward batter of the SPJ structure. The remaining SPJ profile in the water column is not subjected to high levels of environmental loading (waves, currents) which may cause the structure to fall to one side. The SPJ will rather collapse in on itself, influenced by the inward battered configuration. Hence the 'debris zones' generated as the SPJs degrade is predicted to be localised to the immediate lower section footprints. Degradation of the SPJs will occur over a very long period of time allowing local marine communities to adjust.

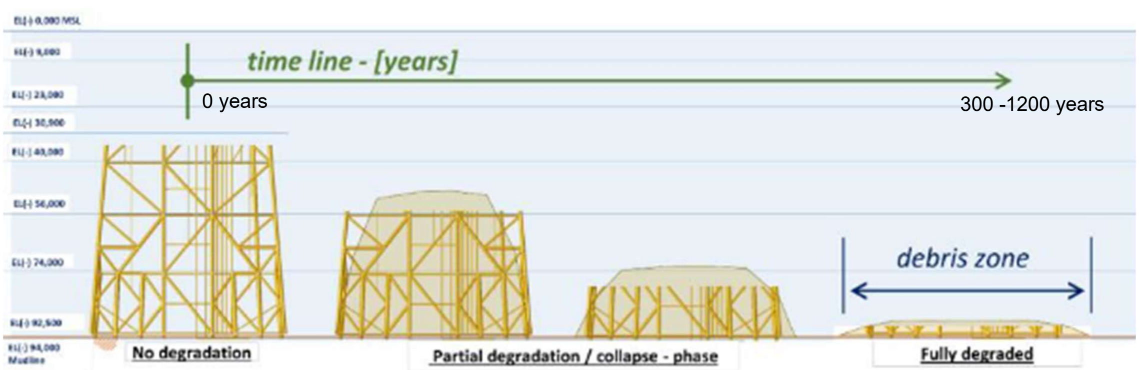
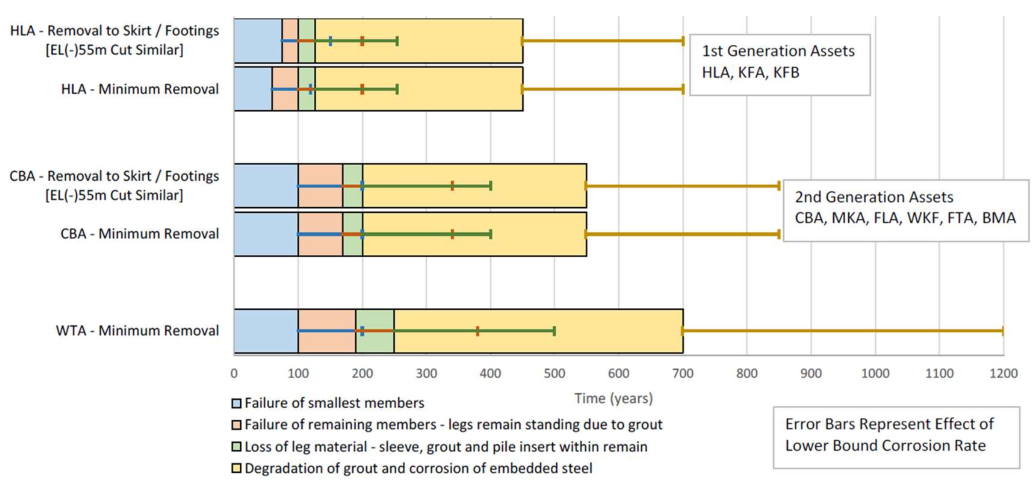


Figure 8-77 Typical 'shipwreck' timeline



Note: The timelines in Figure 8-77 and Figure 8-78 are shown for the upper bound corrosion rate of 0.1 millimetres per year with error bars indicating the effect of the lower bound corrosion rate, 0.05 millimetres per year.

Figure 8-78 Illustrative example shipwreck timelines estimated for Halibut, Cobia and Whiting

8.5.2 Adjacent placement of Steel Piled Jacket sections

Only removed sections that do not contain wraps, coatings or storage tanks would be considered for adjacent placement of removed upper sections of some SPJs. Similar to the SPJ lower sections remaining in place, the debris zone associated with any placed materials will be localised to the footprint of the placed sections.

The estimated maximum mass of steel and anodes that could be placed adjacent for each SPJ location are included in Appendix A3, Appendix A4 and Appendix A5. Rates of corrosion and metals dissolution from exposed steel and anodes surfaces are expected to be consistent with those calculated for the SPJ lower sections remaining in place. Hence, degradation of the placed materials will be slow over many years.

8.5.3 Consequence evaluation

8.5.3.1 Consequences of dissolved steel

The steel within the remaining SPJ sections is predicted to degrade gradually over approximately 300-1200 years (Kent Plc, 2022). The potential concentrations of metal leached from the degrading steel were calculated for the water column and the sediment. These calculated concentrations of the metals as compared against guideline values from the ANZECC (2018) water quality guidelines (Kent Plc, 2022) to identify potential environmental impacts are shown in Table 8-16 and

Table 8-17.

In terms of the ecotoxicological impact of the steel remaining in place, the initial leachate concentrations (at 1 centimetre from the steel surface) are below the available ANZECC (2018) water quality guidelines, hence there is considered to be no acute toxic threat to the marine biota in the water column or sediment around the SPJs. The metals concentrations leaching into the water are expected to fall to background levels within 1-2 metres from the SPJs as the water movements of the area aid dilution and dispersion of the metals, in addition to the binding of metal ions into other compounds that are inert and/or unavailable for use by marine organisms. This results in a minimal impact to water or sediment quality around the SPJs, and a low likelihood of negative (toxic) impacts on marine flora and fauna.

Any impacts as a result of the degradation of steel constituents are expected to be inconsequential and result in no adverse effects to marine biota receptors. Any effects will be localised and of low to moderate intensity, resulting in a **Consequence Level IV** (inconsequential or no adverse effects). Refer to Section 7.4 for more explanation of Consequence Levels.

Table 8-16 Calculated seawater concentrations of chemical constituents found in the SPJ steel compared to ANZECC (2018) water quality guidelines

Chemical	Weight (%)	Seawater calculated concentration (ppb (max) 1cm from jacket	Seawater quality guideline values (ppb) from Australian and New Zealand guidelines for fresh and marine water quality
Carbon	0.25	0.006	N/A
Chromium	1.00	0.025	27.4 (Cr III), 4.4 (Cr VI)
Copper	0.45	0.011	1.3
Iron	98.0	2.439	N/A
Manganese	1.5	0.037	N/A
Nickel	0.5	0.012	7
Phosphorous	0.15	0.004	N/A
Silicon	0.7	0.017	N/A
Sulphur	0.04	0.001	N/A
Others	0.15	0.004	N/A
Aluminium	0.03	0.001	N/A
Niobium	0.03	0.001	N/A
Molybdenum	0.03	0.001	N/A
Vanadium	0.03	0.001	100

Chemical	Weight (%)	Seawater calculated concentration (ppb (max) 1cm from jacket	Seawater quality guideline values (ppb) from Australian and New Zealand guidelines for fresh and marine water quality
Titanium	0.03	0.001	N/A
Calcium	0.03	0.001	N/A
Cerium	0.03	0.001	N/A
Tin	0.03	0.001	N/A
Nitrogen	0.03	0.001	N/A
Boron	0.03	0.001	N/A

Table 8-17 Calculated sediment concentrations of chemical constituents found in the SPJ compared to ANZECC (2018) water quality guidelines

Chemical	Weight (%)	Sediment calculated concentration (ppm) for 1 day interval in 1cm layer	Sediment guideline value mg/kg dry weight (ppm) from Australian and New Zealand guidelines for fresh and marine water quality
Carbon	0.25	0.108	N/A
Chromium	1.00	0.430	80
Copper	0.45	0.194	34
Iron	98.0	42.153	73700
Manganese	1.5	0.645	260
Nickel	0.5	0.215	21
Phosphorous	0.15	0.065	N/A
Silicon	0.7	0.301	N/A
Sulphur	0.04	0.017	N/A
Others	0.15	0.065	N/A
Aluminium	0.03	0.013	26625
Niobium	0.03	0.013	N/A
Molybdenum	0.03	0.013	N/A
Vanadium	0.03	0.013	57
Titanium	0.03	0.013	N/A
Calcium	0.03	0.013	N/A
Cerium	0.03	0.013	N/A
Tin	0.03	0.013	9
Nitrogen	0.03	0.013	N/A
Boron	0.03	0.013	N/A

8.5.3.2 Consequences of dissolved anodes

Any remaining anode materials are estimated to fully degrade in approximately 2.5 years from the time the ICCP is stopped. The potential concentrations of metal leached from any remaining anode were calculated for the water column. The calculated concentrations of the metals were compared against guideline values from the ANZECC (2018) water quality guidelines to identify potential environmental impacts and are shown in Table 8-18.

Table 8-18 Calculated seawater concentrations of chemical constituents found in the SPJ anodes compared to ANZECC (2018) water quality guidelines

Chemical	Weight (%) (1)	Seawater calculated concentration (ppb (max) 1cm from jacket	Seawater quality guideline values (ppb) from Australian and New Zealand guidelines for fresh and marine water quality
Zinc	2.1 – 5.0	6.003	15
Indium	0.017 – 0.05	0.060	N/A
Cadmium	0.008 – 0.012	0.014	0.7
Silicon	0.05 – 0.20	0.240	N/A
Iron	0.15	0.180	N/A
Magnesium	0.6 – 2.2	2.641	N/A
Titanium	0.02 – 0.05	0.060	N/A
Copper	0.006	0.012	1.3
Others	0.05	0.060	N/A
Aluminium	92.294 – 97.825	117.44	N/A

(1) Anodes have been identified as Aluminium-based indium activated alloy. The range of compositions of the relevant Australian codes from the time of construction are summarised in Table 8-18. The differences in composition have no significant effect on the estimated depletion rates of residual anode mass, but are relevant to environmental assessment.

In terms of the ecotoxicological impact from anode materials, the estimated leachate concentrations (at 1 centimetre from the anode surface) are below the guideline values, which indicates there is unlikely to be acute toxic threats to the marine biota in the water column around the SPJs. The metals concentrations leaching into the water are expected to fall to background levels within 1-2 metres from the SPJs as the water movements of the area aid dilution and dispersion of the metals, in addition to the binding of metal ions into other compounds that are inert and/or unavailable for use by marine biota. This results in a minimal impact to water quality around the SPJs and a low likelihood of negative (toxic) impacts on marine biota.

Heavy metals which have the potential to bioaccumulate are listed as a low-level threat (not within the top five threats) in the *Conservation Management Plan for the Blue Whale 2015-2025* (DoEE, 2015c) under the threat category of Habitat modification – Acute and chronic chemical discharge (DoEE, 2015d). Exposure to chronic chemical pollution is also listed as a low-level threat in the *Conservation Management Plan for the Southern Right Whale 2011-2021* (DSEWPC, 2012b) under the threat category of Habitat Modification – Chronic chemical pollution and acute chemical discharge'.

Blue whales feed directly on krill, which occupy a low level on the food chain, and therefore biomagnification in general would not be expected to have a strong effect on blue whales since there are fewer levels in their food chain. However, these pollutants remain a threat because of the long life history of blue whales and the characteristic of these pollutants to accumulate in fat such as whale blubber. Considering the large foraging area of blue whales, their diet on krill and the low likelihood that whales will spend long periods around the SPJs, they are highly unlikely to incur potential bioaccumulation impacts from heavy metals due to degradation of sacrificial anodes remaining on the SPJs. This EP is not inconsistent with the criteria of the *Conservation Management Plan for the Blue Whale 2015-2025* (DoEE, 2015c).

Southern right whales mainly consume copepods in the latitude regions of 41-44ºS, while in higher latitudes krill is the main prey item (DSEWPC, 2012b). Similar to blue whales, the large foraging area of Southern right whales and the low likelihood they will spend long periods foraging around the SPJs means it is very unlikely they will be exposed to an impacts from chronic chemical pollution as a result of degradation of the sacrificial anodes remaining on the SPJs. This EP is not inconsistent with the criteria of the *Conservation Management Plan for the Southern Right Whale 2011-2021* (DSEWPC, 2012b).

Any impacts to marine biota as a result of the degradation of the remaining anodes are expected to be inconsequential and no adverse effects to identified receptors. Any effects will be localised and of low to moderate intensity, resulting in a **Consequence Level IV**. Refer to Section 7.4 for more explanation of Consequence Levels.

8.5.3.3 Consequences of structural disintegration

As the SPJs collapse, habitat higher up in the water column will be removed but hard substrate habitats will be created on the seabed. Due to the slow rates of degradation, the structures will continue to provide hard substrate habitat for marine organisms for a long time period. Under the proposed end states the SPJ sections remaining are predicted to collapse within the existing footprint. If the collapse happened instantaneously or a piece of the SPJ falls, the existing seabed biological habitat and biota within the predicted footprint would be smothered and any biota living on the structure may be buried or crushed. However, under the proposed end states, the collapse is more likely to occur slowly, or part of the structure could fall onto other sections, which would have little effect on the existing environment as the flora and fauna would adapt to the changing structure over time.

Hence, the ecological impact of the gradual degradation of the SPJs is expected to be inconsequential and result in no adverse effects to identified receptors. Any effects will be localized and occur gradually resulting in low to moderate intensity, resulting in a **Consequence Level IV** (inconsequential or no adverse effects). Refer to Section 7.4 for more explanation of Consequence Levels.

8.5.3.4 Consequences of additional placement

SPJ materials in the immediate surrounds will increase the overall mass of steel and anode materials in the environment however the ecotoxicological impact from the additional steel and anode materials would be consistent with that assessed for the lower sections of the SPJs remaining in place. Estimated leachate concentrations (at 1 centimetre from the steel or anode surface) would be below the guideline values, and so there is unlikely to be acute toxic threats to the marine biota in the water column around the placed materials. The metals concentrations leaching into the water are expected to fall to background levels within 1-2 metres as the water movements of the area aid dilution and dispersion of the metals, in addition to the binding of metal ions into other compounds that are inert and/or unavailable for use by marine biota. This results in a minimal impact to water quality around the SPJs and a low likelihood of negative (toxic) impacts on the marine biota in the vicinity of the sections placed on the seabed.

Any impacts are expected to be inconsequential and no adverse effects to identified receptors. Any effects will be localised and of low to moderate intensity, resulting in a **Consequence Level IV** (inconsequential or no adverse effects). Refer to Section 7.4 for more explanation of Consequence Levels.

8.5.4 Controls

Good practice controls and demonstration of ALARP and acceptability are presented in Table 8-19, Table 8-20 and Table 8-21.

Table 8-19 Good practice controls

Good practice	Adopted	Control	Rationale
None identified.			

8.5.5 Demonstration of As Low As Reasonably Practicable

Table 8-20 As Low As Reasonably Practicable demonstration

ALARP decision context and justification	Decision Context B Given this is an infrequent or non-standard activity, Esso believes ALARP Decision Context B should apply. An Engineering risk assessment has been undertaken to assess the costs and benefits associated with additional, alternative and/or improved controls to ensure impacts from the degradation of the infrastructure remaining in place are reduced to ALARP.		
Engineering risk assessment			
Additional, alternative, improved controls	**Benefit**	**Cost /feasibility**	**Adopted**
Complete removal of SPJs including deep foundation piles below the seabed.	All material degradation impacts are eliminated.	The Decommissioning Options Assessment described in Section 3.4 determined that removal of the entire SPJs, including foundation piles below the seabed was not feasible.	Not adopted
Remove SPJs to as to as close as practicable to the seabed deep foundation piles would remain).	Reduction in the volume of material which will degrade in the marine environment.	The Decommissioning Options Assessment determined that removal to allow a 55m clearance below MSL will result in an equal or better environmental outcome than removal as close as	Partially adopted

Additional, alternative, improved controls	Benefit	Cost /feasibility	Adopted
		practicable to the seabed for the SPJs located in deeper water. WTA and BMA will be removed to as close to the seabed as practicable which will reduce the volume of material to degrade in the marine environment.	
Removal of upper sections of the SPJs containing coatings/ wraps or storage tanks to a minimum depth of 55m below MSL.	Elimination of hydrocarbons and other contaminants from the marine environment.	Removal of the upper sections of the SPJs to enable a minimum 55m clearance below MSL will result in the removal of the Monel wraps and integrated leg tanks in some SPJs. These removed sections will not be placed on the seabed and will be taken to an ORC for processing.	Adopted. **CM10** **CM14**
Removal of sacrificial anodes from the SPJs prior to the ICCP system being deactivated.	The degradation of the sacrificial anodes does not present an unacceptable socioeconomic or environmental risk. Any remaining anodes are conservatively expected to fully degrade within approximately 2.5 years once consumption resumes. As the environmental consequence of the degradation of these anodes has been assessed as Consequence Level IV, the removal of the anodes is not expected to provide additional environmental or socioeconomic benefit.	Removal of anodes is considered impracticable given the short duration estimated for any remaining material to fully degrade and the comparative extensive vessel and equipment time that would be required to facilitate any removals.	Not adopted

8.5.6 Demonstration of acceptability

Table 8-21 Demonstration of acceptability

Factor	Demonstration criteria	Criteria met	Rationale
Impact Consequence Level	Impact is **Consequence Level III** or less.	✓	Assessed as **Consequence Level IV**.
Principles of ESD	No significant impacts to relevant receptors so that biological diversity and	✓	Estimated dissolved concentrations of SPJ constituents have been

Factor	Demonstration criteria	Criteria met	Rationale
	ecological integrity is conserved.		assessed as being below applicable trigger guideline values. Structural degradation will occur gradually over a very long period of time allowing receptors to adapt to the changing environment.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	Estimated dissolved concentrations of SPJ constituents are below applicable trigger guideline values. The impacts from material degradation are not expected to result in serious or irreversible environmental damage.
Legislative and other requirements	Legislative and other requirements have been identified and met.	✓	Consistent with the OPGGS Act Section 572(7), this EP is seeking a "deviation" from the expectations of full removal per Section 573(3). The Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australias Coasts and Oceans ((Commonwealth of Australia, 2018) includes an objective of contributing to the long term prevention of the incidence of marine debris (in particular plastic).The proposed activities are not inconsistent with the Threat Abatement Plan, as no plastics are associated with the remaining SPJ structures under the proposed end states. The proposed activities are not inconsistent with the *Conservation Management Plan for the Blue Whale 2015-2025* (DoEE, 2015c) and *Conservation Management Plan for the Southern Right Whale 2011-2021* (DSEWPC, 2012b).
Internal context	Consistent with Esso's Environment Policy (Appendix B).	✓	Proposed activities are consistent with Esso's Environment Policy (Appendix B), in particular, to "comply with all applicable environmental laws and

Factor	Demonstration criteria	Criteria met	Rationale
			regulations and apply responsible standards where laws and regulations do not exist".
	Meets *Project Environmental Standards* (ExxonMobil, 2021b).	✓	There is no specific environmental standard addressing the decommissioning of offshore infrastructure, however the activity meets the intent of the *Project Environmental Standards* (ExxonMobil, 2021b).
	Meets ExxonMobil OIMS objectives.	✓	Proposed activities meet OIMS System 6-5 objective to identify and assess environmental aspects; significant aspects are addressed and controlled consistent with policy and regulatory requirements.
External context	Relevant person feedback has been considered during preparation of the EP.	✓	One concern was raised regarding the degradation of remaining infrastructure during the public comment period (refer to Table 6-18) . Esso considers that the EP (particularly Sections 8.5 and 9.3) assesses the impacts and risks to the environment and other users of the sea as a result of the degradation over time and the ongoing presence of the infrastructure on the seabed.

8.6 Indirect impacts and risks outside of the title areas

The NOPSEMA Section 572 Policy (NOPSEMA, 2022c) requires an EP seeking a deviation from Section 572(3) of the OPGGS Act requirement for full removal of property, to include an evaluation of the 'indirect' consequences which may arise from the petroleum activity of removing property from the title area.

For this EP, the potential indirect environmental impacts and risks relate to the removal of sections of the SPJs to achieve the required clearance above the lower sections of the SPJs proposed to remain in place This includes the following activities:

- transport of removed sections of the SPJ via sea from the title area to an ORC
- dismantling of the removed sections of SPJs and cleaning of marine growth at the ORC
- generation of industrial waste as a result of the removal of the SPJ sections.

Further details on these activities will be included in the Campaign #1 – End State Execution EP/s.

8.6.1 Transport of removed sections of Steel Piled Jacket to an onshore reception center

Once cutting and lifting operations are undertaken offshore, the removed jacket sections will be transported by a contracted vessel from the title area to the ORC.

Potential environmental impacts and risks as a result of these vessel operations may include:

- interference with other marine users
- impacts to marine fauna as a result of underwater noise and light emissions from vessels
- injury, harm or interference to marine mammals
- combustion of fuel resulting in combustion and greenhouse gas emissions, leading to localised decline in air quality and contributions to change in greenhouse gas emissions
- planned vessel discharges such as bilge/drain water, cooling water, sewage/grey water and food waste
- unplanned vessel discharges as a result of spills.

Transport of the removed sections of jacket will be carried out by a contractor with the appropriate resources and capability to undertake this activity. Esso will ensure impacts and risks as a result of these activities are managed by ensuring contracting requirements include provision that all applicable legislation and relevant guidelines (i.e. International Convention for the Prevention of Pollution from Ships (MARPOL)) required to transport the jackets from the title area to the ORC location are identified and complied with.

8.6.2 Dismantling of removed sections of jackets onshore

The removed sections of SPJs will be dismantled at the ORC by a third party into smaller components for further processing (i.e. recycling of scrap steel). The jacket sections will also need to be cleaned of coatings (i.e. paint in the splash zones) and any remaining marine growth prior to further processing. These activities have the potential to result in nuisance impacts to sensitive receptors in the surrounding area as a result of odour, noise, increased traffic or air emissions, and impacts to the environment as a result of spills or discharges to water and air.

Esso will ensure environmental impacts and risks associated with dismantling activities are managed by:

- ensuring removal/disposal contracting requirements include the provision that all relevant approvals, permits and consents required to establish and operate the ORC are identified, applied for, received and any conditions complied with
- ensuring removal/disposal contracting requirements include the development and implementation of appropriate ORC environmental management plans.

8.6.3 Waste disposal and resource recovery

Potential waste streams generated by removal of the upper SPJ sections include:

- steel

- grout
- residual hydrocarbons remaining in the integrated storage tanks within some SPJs
- steel coating constituents (i.e. paint in the splash zones)
- marine growth.

Esso is currently undertaking desktop studies of the SPJs to provide a high-level waste inventory mapping for each facility. This will provide preliminary data on the type of waste streams which will be managed appropriately in accordance with local regulations and laws when the SPJs are removed and dismantled at the ORC by a third party. A more detailed assessment of the waste inventory is planned to be carried out prior to execution of the removal of the SPJs.

Waste generated by the removal of the SPJ sections could contribute to pressure on local landfills and potentially lead to air, water and land pollution if not managed appropriately. A generic waste hierarchy is depicted in Figure 8-79.

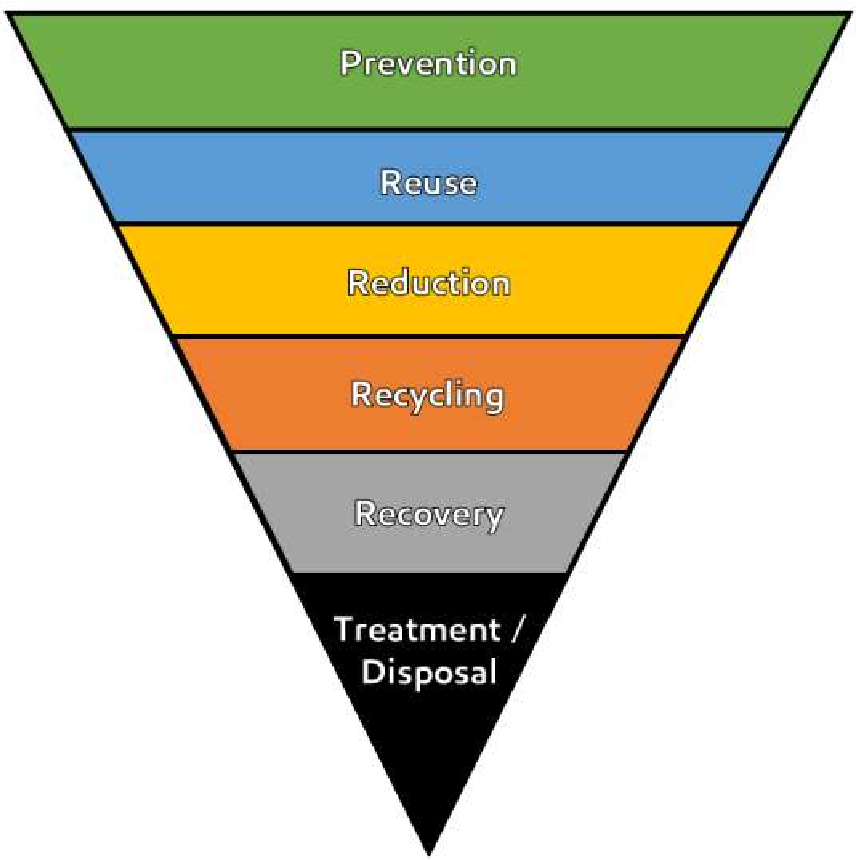


Figure 8-79 Waste hierarchy

8.6.3.1 Prevention, reduction and reuse

The waste hierarchy has been considered when assessing end state options for the SPJs. Some generation of waste material cannot be avoided as a result of achieving the end state's that have been assessed as resulting in an equal or better outcome than complete removal.

The prevention of some waste material will be achieved by the retention of the lower sections SPJs in place and the potential placement of some sections of the removed sections of SPJs on the seabed adjacent to the lower sections.

As discussed in Section 3.2.3 viable re-use options for the SPJ facilities continue to be investigated. However, until such time as viable re-use options are identified, planning will continue for the decommissioning of the facilities.

8.6.3.2 Recycling, recovery and disposal

Structural steel and steel pipework account for the majority of material that will be recovered as a result of the removal of the top sections of the SPJs. The recycling of steel is a well-established industry practice. Steel can be re-used as raw material for other applications, thus reducing the use of energy and natural resources.

Esso will ensure the maximum practicable amount of steel from the removed sections of the SPJs is recycled and that the environmental impacts and risks associated with onshore waste handling, transportation and disposal managed by:

- ensuring removal/disposal contract requirements include the provision to identify and comply with all relevant legislation governing waste management and disposal in the onshore jurisdiction(s) within which these activities will take place
- developing a waste and resource recovery management strategy in conjunction with removal/disposal contractors, which will consider the waste hierarchy when determining recovery and disposal options for the removed SPJ sections and ensure waste is tracked.

8.6.4 Controls

Good practice controls are presented in Table 8-22.

Table 8-22 Good practice controls

Good practice	Adopted
Ensure removal/disposal contracting requirements include provision that all applicable legislation and relevant guidelines required to transport the SPJ sections from the title area to the designated ORC location are identified and complied with.	Adopted **CM15**
Ensure removal/disposal contracting requirements include provision that all applicable approvals, permits and consents required to establish and operate the ORC are identified and complied with.	Adopted **CM16**
Ensure disposal contracting requirements include identifying and complying with all relevant legislation governing waste management and disposal in the onshore jurisdiction(s) within which disposal activities will take place.	Adopted **CM18**
Additional controls	**Adopted**
Develop a waste and resource recovery strategy in conjunction with removal/disposal contractors which incorporates consideration of the waste hierarchy.	Adopted **CM19**

Ensure removal/disposal contracting requirements include the development and implementation of appropriate ORC environmental management plans.	Adopted **CM17**

Esso has determined that the application of these controls will ensure the environmental impacts and risks indirectly associated with the proposed SPJ end states will be identified and managed to ensure they are minimised.

9 Environmental Risk Assessment

9.1 Overview

The purpose of the risk assessment is to ensure that all risks associated with the SPJ end states are identified and evaluated, and the resulting risks are demonstrated to be reduced to ALARP and acceptable levels in accordance with the Esso impact and risk assessment methodology outlined in Section 7.

The assessment of risks has been undertaken in two stages:

- risk scoping (refer to Section 9.2)
- detailed Evaluation (refer to Section 9.3).

9.2 Risk scoping

Scoping of the risks relevant to the activity ensures that a systematic assessment is undertaken. The context of the risk assessment has been set through the description of the activity (refer to Section 4) and identification of potential environmental receptors within the OAs (refer to Section 5). By considering the relationship between environmental aspects and the activity, Esso has identified the risks to receptors which could potentially occur as a result of the proposed SPJ end states.

The assessment of risks has considered direct, indirect and cumulative impacts, as defined in Section 7.2.

A series of workshops were held to identify environmental impacts and risks associated with the SPJ end states and the options for disposal of the removed sections of jackets and to assess controls to ensure impacts and risks are managed to ALARP and an acceptable level. The workshops were attended by environment, structural engineering, offshore projects, risk assessment, management, ExxonMobil subject matter experts in marine ecology and decommissioning engineering personnel.

Impacts and risks were evaluated using the impact assessment methodology (refer to Section 7.4) to determine consequence to receptors and ALARP decision context, and to determine likelihood and residual level of risk.

Control measures were identified, and an assessment of acceptability was undertaken against the defined acceptable levels of environmental performance (refer to Table 7-8). Controls are applied where a reduction in the consequence or the likelihood of the risk will occur as a result of their adoption. They may also be required by legislation, or by ExxonMobil's OIMS. Good practice, as defined in Section 7.6.1, and additional control measures were considered and assessed as part of the demonstration of ALARP and acceptability.

For most aspects identified, it was determined that risks were reduced to ALARP and to an acceptable level. These aspects are presented in Table 9-1 and Table 9-2. In some instances, a more detailed evaluation was considered warranted. These risk evaluations, and the outcomes of the assessment, are described in Sections 9.3 and 9.4.

EPOs and EPSs relevant to risks associated with the SPJ end states and the options for disposal of the removed sections of jackets are provided in Section 10.

9.2.1 Steel Piled Jackets end states risk assessment

Table 9-1 Risk scoping – Proposed Steel Piled Jacket end states

<table>
<tr><th rowspan="2">SPJ end state</th><th rowspan="2">Scenario</th><th rowspan="2">Impact</th><th rowspan="2">Affected receptor(s)</th><th rowspan="2">Consequence and likelihood evaluation</th><th rowspan="2">Consequence level</th><th rowspan="2">Likelihood</th><th rowspan="2">Risk ranking</th><th colspan="4">Demonstration of ALARP</th><th colspan="2">Demonstration of acceptability</th></tr>
<tr><th>ALARP decision context</th><th>Good practice control measures</th><th>Additional control measures considered</th><th>ALARP outcome</th><th>Acceptability assessment</th><th>Acceptability outcome</th></tr>
<tr><td>Lower sections of HLA, FTA, CBA, MKA, KFA, KFB, WKF and FLA SPJ's (including strut footings where present and foundation piles below the seabed) decommissioned in place – SPJs cut to ensure a minimum 55m clearance below MSL.

SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – jacket cut as close as practicable to the seabed (without large scale dredging).</td><td>Accidental release – loss of vessel cargo.

The presence of the lower sections of the SPJs remaining in place could result in an unplanned interaction with a commercial shipping vessel, leading to loss of cargo (assumed on a worst-case basis to be a hazardous substance release to the marine environment).</td><td colspan="12">This scenario has been assessed as not credible.

Consistency with IMO Standard 3.6 (IMO Res. A.672(16), 1989) ensures that an unobstructed water column of at least 55m will be provided above the lower sections of HLA, FTA, CBA, MKA, KFA, KFB, WKF and FLA to ensure the safety of navigation. A risk assessment carried out by AMC Search in 2022 concluded that 'removal at 55m will not affect the passage of merchant vessels of current design characteristics'. It was also assessed that it is 'unlikely that the deepest clearances will increase substantially due to the significant amount of dredging that would be required to allow access for much larger vessels to Australian ports' (AMC Search, 2022a).

Due to the water depth at WTA (54m) and BMA (59m), the SPJs at these locations will be cut as close to the seabed as practicable – which may be up to 5m above the seabed depending on the feasibility of internal or external cutting methods. For WTA this will not achieve an unobstructed water column of at least 55 metres, and for BMA this may not achieve an unobstructed water column of 55m, depending on the depth of cut that can be achieved. For the purposes of assessing risks to commercial vessels, a maximum elevation of 5m above the seabed has been assumed, hence the water clearance above WTA would be approximately 49m and the clearance above BMA would be approximately 54m. A risk assessment carried out by AMC Search in 2022 concluded that 'removal to just above the seabed will not affect the passage of merchant vessels, unless they are required to anchor in the vicinity in an emergency' (AMC Search, 2022b). The deployment of anchors in the vicinity of the SPJ footings remaining in place at WTA or BMA is not considered to have the potential to result in damage to the vessel that would result in a release to the marine environment.

Analysis of shipping data (from automatic identification systems) over a 5-year period (prior to 2020 when shipping activity was considered to be impacted by the global pandemic), indicated that just 1.6% of the vessels transiting through the area adjacent to the OAs had a clearance in excess of 17m, and 93% of the vessel's transiting the area had a clearance of less than 13m. The 'dynamic clearance,' which takes into account the effects of waves causing the vessel to move up and down in the vertical plane, was calculated for a vessel with a sailing clearance of 18m. The 'dynamic clearance' was calculated at various wave heights expected to be experienced in Bass Strait based on hind cast data. The maximum 'dynamic clearance' for a vessel of this size transiting Bass Strait, including a safety factor of 50% to take account of potential under-estimation due to vessel roll and a further 30% safety factor as recommended by the Maritime and Coastguard Agency UK, was calculated to be 38.2m (AMC Search, 2022b). A container ship of this clearance is not likely to be transiting the area given clearance limitations in nearby ports (AMC Search, 2022a).

Hence the likelihood of a surface vessel interacting with the lower sections of the SPJs remaining in place, is not credible, even in the event that existing controls preventing large vessels from entering the area TSS and ATBA) are potentially removed in the future and vessels are able to transit directly over the SPJ lower sections remaining in place.

On the basis of this risk assessment, marking of the SPJ lower sections remaining in place in accordance with the IALA guidance The Marking of Offshore Man-Made Structures (IALA, 2021) is not considered to be required.</td></tr>
</table>

SPJ end state	Scenario	Impact	Affected receptor(s)	Consequence and likelihood evaluation	Consequence level	Likelihood	Risk ranking	Demonstration of ALARP				Demonstration of acceptability	
								ALARP decision context	Good practice control measures	Additional control measures considered	ALARP outcome	Acceptability assessment	Acceptability outcome
Lower sections of HLA, FTA, CBA, MKA, KFA, KFB, WKF and FLA SPJ's (including strut footings where present and foundation piles below the seabed) decommissioned in place – SPJs cut to ensure a minimum 55m clearance below MSL. SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place – jacket cut as close as practicable to the seabed (without large scale dredging).	Unplanned interaction with commercial fishing equipment.	Socioeconomic impacts such as loss of income due to loss of current and future fishing catch, having to replace and/or repair fishing vessel and fishing equipment.	Commercial fishing.	Detailed evaluation in Section 9.3.									
Lower sections of HLA, FTA, CBA, MKA, KFA, KFB, WKF and FLA SPJ's (including strut footings where present and foundation piles below the seabed) decommissioned in place – SPJs cut to ensure a minimum 55m clearance below MSL. SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place - cut as close as practicable to the seabed (without large-scale dredging).	Introduction and spread of IMS. SPJ lower sections remaining in place provide potentially suitable habitat for initial colonisation by an IMS. SPJ lower sections remaining in place act as potential vectors to the spread of introduced IMS (between multiple SPJs and/or natural areas).	Change in ecosystem dynamics. Where habitat is suitable, IMS are likely to have little or no natural competition or predators, thus potentially outcompeting native species for food or space, preying on native species, or changing the nature of the local ecosystem. Changes in the functions, interests or activities of other users of the sea. IMS could deplete fishing grounds and aquaculture stock.	Benthic habitat and ecosystem. Commercial fisheries. Recreational fishing.	Detailed evaluation in Section 9.4.									

Two options for the disposal of the removed upper sections of the SPJs are being evaluated:

- Disposal option #1: removed SPJ sections placed adjacent to the lower sections of the SPJ remaining in place, entirely within the title area (placement option relevant for HLA, CBA, MKA, KFA, KFB, WKF and FLA), or
- Disposal option #2: removed SPJ sections transported to an ORC for dismantling and processing for disposal

The results of the impact scoping for Option #1 has been presented in Table 8-2. Results of the evaluation of the environmental impacts and risks of Option #2 have been presented in Section 8.6 of this EP (these are indirect impacts and risks as a consequence of removing property from the title areas).

Table 9-2 Risk scoping – Disposal options for removed sections of jackets

Disposal option	Scenario	Impact	Affected receptor(s)	Consequence and likelihood evaluation	Consequence level	Likelihood	Risk ranking	Demonstration of ALARP				Demonstration of acceptability	
								ALARP decision context	Good practice control measures	Additional control measures considered	ALARP outcome	Acceptability assessment	Acceptability outcome
Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJS – cut to ensure a minimum 55m clearance below MSL.	Accidental release – loss of vessel cargo. The presence of the placed sections of jackets could result in an unplanned interaction with a commercial shipping vessel, leading to loss of cargo (assumed on a worst-case basis to be a hazardous substance release to the marine environment).	This risk has been assessed for the proposed HLA, CBA, MKA, KFA, KFB, WKF and FLA end states in Table 9-1. If some removed upper sections of SPJs are placed on the seabed they will be placed as close as practicable to lower sections of the SPJs remaining in place. Placed sections will also be cut to ensure that when placed, a minimum clearance of at least 55 metres will be provided below MSL. As such, the assessed risk of this scenario is consistent with the risk assessed for the lower sections of HLA, CBA, MKA, KFA, KFB, WKF and FLA remaining in place in Table 9-1, which was not credible.											
Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL.	Unplanned interaction with commercial fishing equipment.	Socioeconomic impacts such as loss of income due to loss of current and future fishing catch, having to replace and/or repair fishing vessel and fishing equipment.	Commercial fishing.	Detailed evaluation in Section 9.3.									
Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs – cut to ensure a minimum 55m clearance below MSL.	Introduction and spread of IMS. Placed SPJ sections provide a potentially suitable habitat for initial colonisation by an IMS. Placed SPJ sections act as potential vectors to the spread of introduced IMS (between multiple SPJs and/or natural areas).	Change in ecosystem dynamics. Where habitat is suitable, IMS are likely to have little or no natural competition or predators, thus potentially outcompeting native species for food or space, preying on native species, or changing the nature of the local ecosystem.	Benthic habitat and ecosystem. Commercial fisheries. Recreational fishing.	Detailed evaluation in Section 9.4.									

Disposal option	Scenario	Impact	Affected receptor(s)	Consequence and likelihood evaluation	Consequence level	Likelihood	Risk ranking	Demonstration of ALARP				Demonstration of acceptability	
								ALARP decision context	Good practice control measures	Additional control measures considered	ALARP outcome	Acceptability assessment	Acceptability outcome
		Changes in the functions, interests or activities of other users of the sea. IMS could deplete fishing grounds and aquaculture stock.											

9.3 Interaction with commercial fishing vessels

9.3.1 Description

The proposed end states for the SPJs and the option of placing some upper sections of the HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs on the seabed adjacent (referred to collectively in this section as 'infrastructure') will result in the ongoing presence of infrastructure on the seabed, which will not be overtrawlable. This has the potential to result in interactions between remaining infrastructure and commercial fishing vessels, particularly trawling vessels. If an interaction was to occur, potential socioeconomic impacts have been assessed associated with:

- loss of income due to having to replace/repair fishing vessel and fishing equipment
- loss of income due to loss of fishing catch.

The OAs coincide with a number of Commonwealth and State managed fisheries (refer to Section 5.1). Section 8.4 provides an overview of the commercial fishing methods in Bass Strait that may be impacted by the SPJ end states.

9.3.2 Consequence evaluation

Esso engaged AMC Search, the Training and Consultancy Division of the Australian Maritime College to investigate the potential risks posed to commercial fishing from decommissioning options for the CGSs in Bass Strait (AMC Search, 2022c). This report was also used to provide information on the potential risks from the proposed end states for the SPJs.

In undertaking the risk assessment, the following aspects were considered:

- the differing physical attributes (length, breadth, trawl boards, etc.) of the equipment used for various fishing methods and how such equipment could interact with remaining infrastructure
- the factors that influence the probability of potential snagging, including:
- inability to detect remaining infrastructure using the vessel's electronic devices (e.g. chart plotter, vessel automatic identification system, GPS)
- intentional or unintentional approach to remaining infrastructure
- Intentional or unintentional turning/dragging while towing or recovering equipment
- the duration that a vessel using a particular fishing method takes to undertake its fishing and the areal extent (length, breadth) of the equipment for each particular fishing method.

The fishing methods assessed included demersal (bottom) trawl fishing, Danish seining, dredging, demersal gillnetting and purse seining. A more detailed description of these fishing methods is provided in Section 8.3.1. These fishing methods (with the exception of purse seine) were assessed as resulting in the following credible socioeconomic consequences as a result of potential interaction with infrastructure remaining in place:

- damage to fishing equipment resulting in moderate sized holes in nets
- no damage to fishing vessel
- one to two days of downtime and associated income loss.

The purse seine fishing method was assessed to have the following socioeconomic consequences as a result of potential interaction with infrastructure remaining in place:

- damage to fishing equipment including torn netting, frameline breakage
- minor impacts/scrape damage to fishing vessel surfaces
- up to a week of downtime and associated income loss or less.

For all fishing methods, there is the potential for a localised short-term impact, resulting in a **Consequence Level III** (potential short term, minor adverse effects).

9.3.3 Likelihood evaluation

AMC Search considered a number of factors that influence the likelihood of snagging:

- inability to detect a hazard in the fishing equipment's pathway
- inability to navigate safely around marked obstacles
- lapses in good vessel operational practices
- duration of exposure in the OAs
- the areal extent of the equipment for each fishing method and how much seabed is covered per day.

Based on AMC Search's assessment of these factors, the likelihood of snagging on infrastructure remaining in place during each fishing method was estimated as follows:

- Demersal (bottom) fish trawling: Could happen when more than one factor is present otherwise unlikely to occur.
- Danish seining: Not certain to happen but an additional factor is likely to result in incident.
- Dredging: A rare combination of factors would be required for an incident to result.
- Purse seining: Could happen when additional factors are present otherwise unlikely to occur.
- Demersal gill netting: A rare combination of factors would be required for an incident to result.

Using this information, Esso assessed the overall likelihood of a vessel or fishing equipment snagging on infrastructure left in place to be **Unlikely (C)**. Risk ranking

As shown in Table 9-3, based on the **Consequence Level III** (potential short term, minor adverse effects) and the assessed **Likelihood C (Unlikely)**, the overall risk ranking was assessed as **Category 3 (Medium)**.

Table 9-3 Risk ranking outcome

Consequence Level	Likelihood	Risk ranking
III	C	3

9.3.4 Controls

Good practice controls and demonstration of ALARP and acceptability are presented in Table 9-4, Table 9-5 and Table 9-6.

Table 9-4 Good practice controls – Risks to commercial fishing

Good practice	Adopted	Control	Rationale
Notification to commercial fishing vessels of infrastructure remaining in place.	Yes	**CM2/CM13:** Locations of remaining infrastructure (lower SPJ sections and removed sections of SPJs placed on the seabed) to be identified on navigational charts administered by the AHO to advise marine users of the presence of remaining infrastructure.	Control will ensure commercial fishers are aware of the location of remaining infrastructure.

9.3.5 Demonstration of As Low As Reasonably Practicable

Table 9-5 Demonstration of As Low As Reasonably Practicable – Risks to commercial fishing

ALARP decision context and justification	Decision Context B Removal of the portion of jacket above the sea surface will remove the visual prompt, including navigational lights, for the location of the underwater hazard. Commercial fishing relevant person consultation undertaken throughout the preparation of this EP raised the following key concerns/issues relating to the risks posed as a result of the proposed end states: • Frustration regarding the need to 'remap' fishing activities so as to avoid structures remaining on the seabed; • Compensation/liability arrangements in the event of an unplanned interaction between a commercial fishing vessel and the infrastructure remaining in place. Based on the assessed **Consequence Level III**, Esso believes **ALARP Decision Context B** should apply. An Engineering risk assessment has been undertaken to assess the costs and benefits associated with additional, alternative and/or improved controls.		
Engineering risk assessment			
Additional, alternative, improved controls	**Benefit**	**Cost/feasibility**	**Adopted**
Retain the portion of the jacket above the sea surface.	The visual prompt for the underground hazard would remain	The option of retaining the above water portion of the SPJs was assessed in the Decommissioning Options Assessment, but was assessed as not feasible not feasible due to a lack of Australian and	Not adopted

Additional, alternative, improved controls	Benefit	Cost/feasibility	Adopted
		international precedents. Ongoing impacts and risks to other users of the sea are also not considered to be acceptable. Refer to Section 3.2.4.3.	
Install marker buoys (with navigation lights) over infrastructure remaining in place.	May reduce the risk of commercial fishing equipment being snagged on infrastructure remaining in place.	Feasible to install but previous experience with such buoys in Bass Strait is that they are prone to breaking free, hence would not be an effective control. Surveillance of buoys would increase helicopter or marine personnel exposure. Maintenance of navigation lights or replacement of lost buoys would require equipment (work-class ROV) that is not available in ongoing Bass Strait operations.	Not adopted
Install over trawlable structures/cages on infrastructure remaining in place.	May reduce the risk of commercial fishing equipment being snagged on infrastructure remaining in place.	Feasible to build but installation will not eliminate the risk of snagging on the edges of cages. Cages will deteriorate over time and potentially require replacing. Cost is considered disproportionate to the reduction in risk afforded by their installation.	Not adopted
Esso to update plotter files for commercial fishing vessels active in the OAs. (Commercial fishers that have been consulted are concerned that anything left on the seabed that isn't overtrawlable requires fishers to re-map their activities.)	Reduces the risk of an adverse interaction with the infrastructure remaining in place.	Already used by other operators so feasible. Low cost relative to reducing the risk of an unplanned interaction by better informing fishing vessels of the presence of the infrastructure remaining in place.	Adopted **CM4**
Upgrade echo sounders on fishing vessels to wide angle sonar seabed profiler.	Increases detection width of seabed obstacles.	Estimated installed cost for a single vessel is over $120,000; extra seabed visibility with the Profiler still not sufficient for Danish seine (AMC Search, 2022c).	Not adopted

Additional, alternative, improved controls	Benefit	Cost/feasibility	Adopted
Avoid fishing offshore in small vessels in unfavourable environmental conditions.	Reduced risk of fishing incident.	N/A as outside of Esso's control.	Not adopted
Upgrade vessel Safety Management System.	Reduced risk of fishing incident.	N/A as outside of Esso's control.	Not adopted
Utilise a winch tension release mechanism.	Reduces likelihood of a vessel capsizing.	Cost of new system is $150,000 per boat. Retrofit if suitable at $50,000 per boat. Likely feasible, however preferable to reduce risk by avoiding hazard through improved plotters, which is higher in the hierarchy of safety controls.	Not adopted
Design/rig fishing equipment with appropriate breaking load components.	Reduces likelihood of a vessel capsizing.	N/A as outside of Esso's control.	Not adopted
Use a hydroacoustic trawl monitoring system.	Provides better information to fishing vessels on the location of fishing equipment when underwater.	Cost $80,000 per boat; better to reduce risk by avoiding hazard through improved plotters, which is preferable in the hierarchy of safety controls.	Not adopted
Adhere to AMSA's trawler hook-up safety procedures/guidelines (if not already).	Provides guidance to fishers on how to respond to a hook-up.	N/A as outside of Esso's control.	Not adopted
Implementation of an appropriate compensation framework Commercial fishers that have been consulted as part of the preparation of this EP have requested information as to the ongoing compensation/liability arrangements.	Mitigate socioeconomic losses to commercial fishing vessels in the event of an adverse interaction with the infrastructure remaining in place.	Compensation arrangements currently in place will continue until Esso ceases to and Esso will investigate appropriate compensation models.	Adopted **CM5** **CM6**

9.3.6 Demonstration of acceptability

Table 9-6 Demonstration of acceptability – Risks to commercial fishing

Factor	Demonstration criteria	Criteria met	Rationale
Risk assessment process for unplanned events	The risk ranking is lower than **Category 1**.	✓	Risk is **Category 3**.
Principles of ESD	No potential to affect biological diversity and ecological integrity.	✓	The possibility of a commercial fishing vessel snagging on infrastructure remaining in place does not have the potential to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	Activity does not have the potential to result in serious or irreversible environmental damage.
Legislative and other requirements	Legislative and other requirements have been identified and met.	✓	Complies with OPGGS Act Section 281 – minimum interference with other rights.
Internal context	Consistent with Esso's Environment Policy (Appendix B).	✓	Proposed activities are consistent with Esso's Environment Policy (Appendix B).
	Meets *Project Environmental Standards* (ExxonMobil, 2021b).	✓	Activity is aligned with the intent of the *Project Environmental Standards* (ExxonMobil, 2021b).
	Meets ExxonMobil OIMS objectives.	✓	Meets objectives of OIMS System 10-1: Community Awareness and Public Affairs.
External context	Relevant person feedback has been considered during preparation of the EP.	✓	Esso has engaged with commercial fishing relevant persons to obtain feedback and consider and address concerns. This feedback has informed the risk assessment in Section 9.3 and the

Factor	Demonstration criteria	Criteria met	Rationale
			development of controls (specifically CM4, CM5 and CM6) Refer to Section 6 and Appendix C1 for detailed information.

9.4 Facilitation of the spread of introduced invasive marine species

9.4.1 Description

An IMS is a species occurring, as a result of human activities, beyond its accepted normal distribution and which threatens the environment, human health or economic values by the damage it causes (DCCEEW, 2019). Not all non-indigenous marine species introduced into new environments will cause demonstrable effects and become IMS; some are relatively benign, and few have spread widely beyond ports and harbours.

The following pathways associated with the SPJ end states and the option of placing some upper sections of the HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs on the seabed adjacent (referred to collectively in this section as 'infrastructure') have the potential to result in the spread of IMS via:

- the infrastructure remaining in place provides a potentially suitable habitat for initial colonisation by an IMS
- the infrastructure remaining in place act as potential vectors to the spread of introduced IMS, between multiple facilities and/or natural areas - if initial colonisation was successful.

Most efforts have focused on ships as a transport vector for the translocation of IMS, which is comprised of several sub-vectors, such as (Hewitt & Campbell, The relative contribution of vectors to the introduction and translocation of invasive marine species, 2010):

- biofouling on the hull, sea chests, propeller, rudder, exposed surfaces of water piping, thruster tunnels and other niche areas
- the boring of organisms into the structure of the vessel (primarily limited to wooden-hulled vessels)
- the uptake of organisms in association with wet or dry ballast.

It has also been hypothesised that oil and gas platforms may act as a vector, or conduit, to facilitate the spread of IMS by providing suitable habitat in areas where it does not exist naturally (Melbourne-Thomas, et al., 2021) (Macreadie, Fowler, & Booth, 2011). The extent to which species (both invasive and non-invasive) may move or spread between habitats is dependent on the degree of ecological connectivity, both between the structures and between the structures and natural habitats. As discussed in Section 8.4.6.3 of this EP, ecological connectivity is defined as the movement of individuals and genes among 'nodes' - where 'nodes' may represent sources and/or destinations (McLean, et al., 2022). The distance and direction of species distribution is influenced by physical processes within the marine environment, primarily the ocean currents.

The facilitation of the spread of an IMS by the infrastructure remaining in place, if initial colonisation occurs, has the potential to result in effects to seabed habitat and marine ecosystems due to:

- changes in ecosystem dynamics
- changes in the functions, interests or activities of other users.

IMS are likely to have little or no natural competition or predators, thus potentially outcompeting native species for food or space, preying on native species, or changing the nature of the environment. Once established, some pests can be difficult to eradicate (Hewitt, 2002) and therefore there is potential for a long-term or persistent change in habitat structure. It has been found that highly disturbed environments (such as marinas) are more susceptible to colonisation than open-water environments, where the number of dilutions and the degree of dispersal are high (Paulay, Kirkendale, Lambert, & Meyer, 2002).

IMS can also deplete fishing grounds and aquaculture stock, with between 10 percent and 40 percent of Australia's fishing industry being potentially vulnerable to marine pest incursion. For example, the introduction of the Northern Pacific seastar in Victorian and Tasmanian waters was linked to a decline in scallop and oyster fisheries (Commonwealth of Australia, 2008).

The Northern Pacific seastar was first found in Tasmania in 1986 and by 1995 was also found in Victoria (Marine Education Society of Australasia, 2022a). Whilst there is potential for this species to be present in Bass Strait, there were no sightings recorded as part of Environmental Survey #1 (Summer).

Similarly, the New Zealand screw shell, thought to have been introduced on dry ballast or through the live oyster trade, may threaten other mollusc species, including scallops. It was first introduced to Tasmania about 80 years ago. Since then, it has spread as far north as New South Wales (Marine Education Society of Australasia, 2022b). The New Zealand screw shell is known to be present in eastern Bass Strait and is known to form extensive and dense beds on the sandy seafloor spreading to the 80 m isobath of eastern Victoria and NSW (Patil, et al., 2004). The New Zealand screw shell can densely blanket the seabed with live and dead shells and faecal pellets and therefore smother other seabed species (ABC Science, 2000). There were no recordings of the New Zealand screw shell as part of Environmental Survey #1 (Summer).

9.4.2 Consequence evaluation

If an introduced IMS successfully colonised the infrastructure remaining in place, given the distance from nearshore environments and the nearest sensitive protected marine areas, it is expected that colonies would remain isolated to the infrastructure remaining in place. Hence there is the potential for a localised, but irreversible, impact to the benthic habitat and communities present on the SPJs which may affect the ecological value of the infrastructure remaining in place.

Therefore, there is the potential for a localised, but irreversible, impact to habitat resulting in an assessed **Consequence Level III** (potential minor adverse effects).

9.4.3 Likelihood evaluation

9.4.3.1 Colonisation of the infrastructure remaining in place

The habitat provided by the infrastructure remaining in place could facilitate the establishment of IMS by providing suitable habitat in the event IMS are introduced.

The introduction of IMS would require:

- colonisation and establishment of the marine pest on a vector (e.g. vessel hull) in a donor region (e.g. home port)
- survival of the settled marine species on the vector during the voyage from the donor to the recipient region (e.g. location of infrastructure remaining in place
- colonisation (e.g. dislodgement or reproduction) of the marine species on the infrastructure remaining in place, followed by successful establishment of a viable new local population.

Introduction of IMS can be via the discharge of ballast water from vessels containing IMS or via the biofouling of the vessel hull or niches. Vessels that may be in the OAs are expected to be in compliance with Australian regulatory requirements for the management of ballast water, which requires that exchange of ballast water should be undertaken at least 200 nautical miles offshore and in at least 200 metres of water (unless the voyage cannot practically meet these requirements). The OAs are well within 200 nautical miles from shore and the SPJ located in the deepest water depth is MKA in 93 metres of water.

The probability of all of these steps being realised and an affected vessel dislodging an IMS in close enough vicinity to the infrastructure remaining in place to allow survival and colonisation of an IMS is considered to be very low.

9.4.3.2 Facilitation of the spread of IMS, in the event colonisation is successful

Despite the probability of successful establishment of an IMS colony on the infrastructure remaining in place being considered as very low, if this was to occur there is potential for larvae of the IMS to spread across the infrastructure and nearby natural reef areas (South East Reef). While studies that have shown that exotic species can spread between oil and gas structures in other jurisdictions (Simons, et al., 2016) (Page, et al., 2019), the risk of this spread needs to be considered on a case-by-case basis, as it depends on the organisms present on the structures, and the degree of ecological connectivity between the structures/nearby reef areas.

Few modelling studies have explored the possible larval connectivity via ocean circulation between offshore infrastructure and natural habitats. These studies have suggested that offshore structures could increase connectivity by acting as intermediate ‘stepping stone’ habitat, thereby contributing to species range expansions, but also emphasise the importance of local hydrodynamics and planktonic larval durations in driving observed patterns of larval dispersal (Page, et al., 2019).

The nearest marine areas of higher value or sensitivity are the East Gippsland Marine Park, over 120 kilometres to the east and Beagle Marine Park, over 90 kilometres to the southwest of the nearest SPJ location.

No introduced IMS were observed on any imagery collected during Environmental Survey #1 (Summer) (AIMS, 2022a). Similarly, no introduced IMS were observed in the review of historical ROV footage (Sih T. , Cure, Yilmaz, Macreadie, & McLean, Marine biota associated with oil and gas infrastructure off the Gippsland coast, 2021b). It was noted that the resolution of the historic ROV imagery would not be sufficient to identify small IMS (<10 centimetres). The image quality collected during Environmental Survey #1 (Summer) was of a significantly higher resolution and quality than the historical ROV footage. No indications of IMS were identified in the visual footage collected as part of Environmental Survey #1 (summer).

The characteristics of IMS are to reduce or eliminate populations of native species through predation or competition. The observed well established and diverse nature of the communities on the SPJs, coupled with the length of time the SPJs have been in place indicates the likelihood of IMS being present and not captured in observations is considered to be low.

As the likelihood of introduction and colonisation of IMS onto the infrastructure remaining in place in the future is considered to be low, even if the structures are ecologically connected (to be further assessed by undertaking a study on connectivity – see **CM8**), the likelihood of the infrastructure remaining in place facilitating the spread of IMS to marine areas of higher value or sensitivity is considered to be **Very Unlikely (D)**.

9.4.4 Risk ranking

As shown in Table 9-7, the assessed **Consequence Level III (potential minor adverse effects)** and assessed probability range (likelihood) of **Very Unlikely (D)** results in the risk of the infrastructure remaining in place being colonised by an IMS and subsequently facilitating the spread of this IMS being assessed as **Category 4 (Lower risk).**

Table 9-7 Risk ranking outcome

Consequence Level	Likelihood	Risk ranking
III	D	4

9.4.5 Controls

No good practice controls were identified (Table 9-8). Demonstration of ALARP and acceptability are presented in Table 9-9 and Table 9-10.

Table 9-8 Good practice controls – Risk of spread of invasive marine species

Good practice	Adopted	Control	Rationale
None identified.			

9.4.6 Demonstration of As Low As Reasonably Practicable

Table 9-9 Demonstration of As Low As Reasonably Practicable – Risk of spread of invasive marine species

ALARP decision context and justification	Decision Context B The potential causes resulting in an introduction of IMS from ballast water discharge or biofouling are well understood and managed by national and international regulations and industry guidance. The risk of the infrastructure remaining in place acting as vectors for the spread of an IMS is less well understood. Given the potential for an irreversible effect on the habitat value of the infrastructure remaining in place, there is the potential for **Consequence Level III** impacts. Based on the **Consequence Level III** rating, Esso believes **ALARP Decision Context B** should apply. An Engineering risk assessment has been undertaken

	to assess the costs and benefits associated with additional, alternative and/or improved controls.

Engineering risk assessment			
Additional, alternative, improved controls	**Benefit**	**Cost/feasibility**	**Adopted**
Eliminate the transit of vessels over the locations of the infrastructure remaining in place.	This would eliminate the risk of initial colonisation of the infrastructure via biofouling or discharge of ballast.	This control is not considered feasible as it would result in ongoing exclusion of other marine users from the OAs. This would necessitate the implementation of an ongoing exclusion zone which would require enforcement by a regulatory agency in perpetuity. The administrative burden, ongoing impacts to other marine users and difficulty with implementing are not considered to be justified given the assessed low likelihood of successful colonisation of the infrastructure remaining in place by an IMS.	Not adopted

9.4.7 Demonstration of acceptability

Table 9-10 Demonstration of acceptability – Risk of spread of invasive marine species

Factor	Demonstration criteria	Criteria met	Rationale
Risk assessment process for unplanned events	The risk ranking is lower than Category 1.	✓	The risk ranking is Category 4 (the lowest category) and therefore considered acceptable.
Principles of ESD	No potential to affect biological diversity and ecological integrity.	✓	There is potential for a localised, but irreversible, impact to benthic communities on the infrastructure remaining in place - resulting in a **Consequence Level III**. This impact is limited in extent (i.e. localised) and is not considered as having the potential to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious or	✓	If introduction and colonisation of an IMS was to occur on the infrastructure remaining in place and spread of this IMS was

Factor	Demonstration criteria	Criteria met	Rationale
	irreversible environmental damage.		facilitated by the infrastructure acting as vectors, there is low potential for serious or irreversible environmental damage. As described in Section 8.4, further evaluation is therefore required against the remaining Principles of ESD where the activity has the potential to result in serious or irreversible environmental damage. Further assessment is undertaken to determine if there is significant uncertainty in the evaluation. Given Environmental Survey 1 (Summer) and the review of historical ROV footage have not observed the presence of IMS on the infrastructure proposed to remain in place, there is no evidence the SPJs are acting as vectors to the spread of IMS. A further study has been commissioned to investigate the ecological connectivity of the SPJs, which will allow Bass Strait-specific data and further reduction in the uncertainty associated with the infrastructure remaining in place acting as vectors for the spread of IMS. There is not significant scientific uncertainty associated with this aspect that will not be addressed, and Principles of ESD are therefore met.
Legislative and other requirements	Legislative and other requirements have been identified and met.	✓	There are legislative and other requirements relevant to the management of IMS, including: • *Biosecurity Act 2015* • *Australian Ballast Water Management Requirements* (DAWR, 2017) • *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006* • Marine Order 98 (Marine pollution - anti-fouling systems) 2013 • *National Biofouling Guidelines for the Petroleum Production*

Factor	Demonstration criteria	Criteria met	Rationale
			and Exploration Industry (DAWR, 2009). While these requirements will be met for vessels contracted by Esso transiting to the OAs, the compliance of vessels not contracted by Esso is not within Esso's control.
Internal context	Consistent with Esso's Environment Policy (Appendix B).	✓	Proposed activities are consistent with Esso's Environment Policy (Appendix B).
	Meets *Project Environmental Standards* (ExxonMobil, 2021b).	N/A	There is no specific environmental standard which addresses the introduction of IMS.
	Meets ExxonMobil OIMS objectives.	✓	Meets OIMS System 6-5 objectives to identify and assess environmental aspects.
External context	Relevant person feedback has been considered during preparation of the EP.	✓	During the voluntary public consultation period, comments were provided regarding the spread of IMS as a result of infrastructure remaining in place. On consideration of these comments, Section 9.5 (below) has been added.

9.5 Facilitation of the spread of climate change range expanding invasive native species

9.5.1 Description

All living organisms have a range of temperatures and other environmental conditions in which they can live. Climate change, particularly in the form of local warming, stimulates and sometimes forces species to move, generally away from the equator towards cooler regions. Movement of native species is a regular occurrence in Australia but may be increasing due to climate change. As species expand their range, they encounter new ecosystems that may not be used to their presence, changing the composition of communities, which can negatively impact the local ecosystem and cause loss of native species (Cresswell, Janke, & Johnston, 2021).

In the southern hemisphere, the south-eastern coast of Australia has been identified as a climate change hotspot. Here the East Australian Current (EAC) has strengthened resulting in greater poleward penetration of warm water over the past 60 years and an approximate quadrupling of ocean warming rates compared to the global ocean average. This pronounced change in the physical oceanography of the region represents an approximate 350 km southward shift in this major current system, which corroborates with an increased number of recent poleward range-expansions of species (Ling & Keane, 2018). At least 198 Australian marine species have undergone long-term shifts in their geographic distributions since 2003, most of which (87.3%) have moved towards cooler waters (Cresswell et al. 2021).

The following pathways associated with the SPJ end states and the option of placing some removed sections of the HLA, CBA, MKA, KFA, KFB, WKF and FLA on the seabed adjacent to the SPJ (referred to collectively in this section as 'infrastructure') have the potential to increase the rate of spread of climate change range expanding native species via:

- providing a potentially suitable habitat for initial colonisation by a range expanding species
- enhancing connectivity to facilitate the spread of in range expanding species, between multiple facilities and/or natural areas - if initial colonisation was successful.

The long spined sea urchin (also known as the Black-spined Urchin) – *Centrostephanus rodgersii* is a range expanding native species of New South Wales that is known to exist in the Bass Strait region and down the eastern coast of Tasmania. The long spined sea urchin was first observed as far south as Tasmania in the late 1970's (Ling & Keane, 2018) and is considered invasive due to its ability to overgraze kelp beds, forming and maintaining stable barrens. The distribution of the long spined sea urchin was historically restricted to subtidal reefs along the coasts of New South Wales, eastern Victoria and the Flinders Island Group, however over the last few decades, its range has expanded southwards to the east coast of Tasmania and westward along the coastline of Victoria. In eastern Victoria *Centrostephanus rogersii* have created extensive barrens on reefs within marine parks within as well as on many other reefs outside parks in the region (Beware Reef Marine Sanctuary and Cape Howe Marine National Park) ((Parks Victoria , 2022)

Observations were made of a small number of the long spined sea urchins on some platforms in Bass Strait during Environmental Survey #1 (Summer) (AIMS, 2022a). The influence of the remaining infrastructure in terms of providing potential connectivity for the long spined sea urchin (and other species) is being assessed. It is noted that despite many decades of presence in the region, the long spined sea urchin has not been able to establish significant population numbers on the SPJs.

9.5.2 Consequence evaluation

Climate change induced range expansion of a native species may have either negative or positive consequences to the range expanding species and the receiving environment depending on the vulnerability of the range expanding species, and ecosystem service of any displaced species within the receiving environment. A range expanding species present in a habitat may not necessarily be considered invasive and therefore not have a negative impact on the receiving environment. However, where invasive potential exists, colonisation could result in changes to ecosystem dynamics which could result in changes to the functions, interests or activities of other users. For invasive species, the infrastructure remaining in place may increase the rate of expansion between structures due to the potential for connectivity.

Despite many decades of presence in the region, the long spined sea urchin has not been able to establish significant population numbers on the SPJs or create barrens at the SPJs as have been seen in Tasmania and eastern Victoria. This suggests that the SPJs are unsuitable habitat for sustaining large populations of the long spined sea urchin. The lack of abundance of the dominant food source for the long spined sea urchin (macroalgae), dense surface coverage by potentially bio-limiting jewel anemones and the presence of predators of the long spined sea urchin, including mature lobsters and Port Jackson sharks at some facilities, may collectively contribute to the unsuitability of the SPJs habitat for the long spined sea urchin.

Based on the minimal observations of long spined sea urchins from the review of historical ROV footage and Environmental Survey #1 (Summer), despite decades of presence in the region, it is considered that there is potential for a localised, but irreversible impact to SPJ habitat from the presence of this species in the region, resulting in an assessed **Consequence Level III** (potential minor adverse effects).

9.5.3 Likelihood evaluation

The capacity for the remaining SPJ structures to act as a vector for range expansion depends on the species-specific colonization success and connectivity potential between the SPJs and vulnerable environments. The nearest marine areas of higher value or sensitivity are the East Gippsland Marine Park, over 120 kilometres to the east and Beagle Marine Park, over 90 kilometres to the southwest of the nearest SPJ locations. Given the influence of the EAC current flow, from the east to west, any range expanding species may reach the East Gippsland Marine Park region without any influence from the SPJs. The likelihood of spread to the Beagle Marine Park as a result of the remaining infrastructure is considered to be unlikely given the large distance to the marine park.

Based on the small number of observations to date of the long spined sea urchin despite the decades of presence in the region, the likelihood of colonisation by new range expanding species onto the infrastructure remaining is considered to be low, even if the structures are ecologically connected. The potential connectivity between the remaining SPJ structures and other natural features in Bass Strait in relation to the long spined sea urchin is currently being modelled and this EP will be reviewed if required when the assessment is complete (see CM8). The likelihood of the infrastructure remaining in place facilitating the spread of range expanding species to marine areas of higher value or sensitivity is considered to be **Very Unlikely (D)**.

9.5.4 Risk ranking

As shown in Table 9-11, the assessed **Consequence Level III (potential minor adverse effects)** and assessed probability range (likelihood) of **Very Unlikely (D)** results in the risk of the infrastructure remaining in place facilitating for the spread of a range expanding invasive native species being assessed as **Category 4 (Lower risk).**

Table 9-11 Risk ranking outcome

Consequence Level	Likelihood	Risk ranking
III	D	4

9.5.5 Controls

No good practice controls were identified (Table 9-12) Demonstration of ALARP and acceptability are presented in Table 9-13 and Table 9-14.

Table 9-12 Good practice controls – Risk of spread of climate change induced range expanding invasive native species

Good practice	Adopted	Control	Rationale
None identified.			

9.5.6 Demonstration of As Low As Reasonably Practicable

Table 9-13 Demonstration of As Low As Reasonably Practicable – Risk of spread of climate change induced range expanding invasive native species

ALARP decision context and justification	Decision Context B The risk of the infrastructure remaining in place acting as vectors for the spread of climate change induced range expanding native species is complex and species dependant. Given the potential for an irreversible effect on the local habitat value of the infrastructure remaining in place, there is the potential for **Consequence Level III** impacts. Based on the **Consequence Level III** rating, Esso believes **ALARP Decision Context B** should apply. An Engineering risk assessment has been undertaken to assess the costs and benefits associated with additional, alternative and/or improved controls.		
Engineering risk assessment			
Additional, alternative, improved controls	**Benefit**	**Cost/feasibility**	**Adopted**
None identified			

9.5.7 Demonstration of acceptability

Table 9-14 Demonstration of acceptability – Risk of spread of climate change induced range expanding invasive native species

Factor	Demonstration criteria	Criteria met	Rationale
Risk assessment process for unplanned events	The risk ranking is lower than Category 1.	✓	The risk ranking is Category 4 (the lowest category) and therefore considered acceptable.
Principles of ESD	No potential to affect biological diversity and ecological integrity.	✓	There is potential for a localised, irreversible impact to benthic communities on the infrastructure remaining in place - resulting in a **Consequence Level III**. This impact is limited in extent (i.e. localised) and is not considered as having the potential to affect biological diversity and ecological integrity.
	Activity does not have the potential to result in serious or irreversible environmental damage.	✓	As described in Section 8.4, further evaluation is required against the remaining Principles of ESD where the activity has the potential to result in serious or irreversible environmental damage. Further assessment is undertaken to determine if there is significant uncertainty in the evaluation. Despite many decades of presence in the region, the long spined sea urchin has not been able to establish significant population numbers on the SPJs or create barrens at the SPJs as have been seen in Tasmania. This indicates that the SPJs are unsuitable habitat for sustaining large populations of long spined sea urchin. The lack of abundance of the dominant food source for the spined sea urchin (macroalgae), dense surface coverage by potentially bio-limiting jewel anemones and presence of predators of the long spined sea urchin, including mature lobsters and Port Jackson sharks at some facilities, may collectively contribute to the

Factor	Demonstration criteria	Criteria met	Rationale
			unsuitability of the SPJs habitat for long spined sea urchin.
Legislative and other requirements	Legislative and other requirements have been identified and met.	✓	No legislative requirements relevant have been identified regarding the management of range expanding native species.
Internal context	Consistent with Esso's Environment Policy (Appendix B).	✓	Proposed activities are consistent with Esso's Environment Policy (Appendix B).
	Meets *Project Environmental Standards* (ExxonMobil, 2021b).	N/A	There is no specific environmental standard which addresses the presence or management of range expanding native species.
	Meets ExxonMobil OIMS objectives.	✓	Meets OIMS System 6-5 objectives to identify and assess environmental aspects.
External context	Relevant person feedback has been considered during preparation of the EP.	✓	During the voluntary public consultation period, comments were provided concerning the possible function of remaining SPJ structure to act as a 'stepping stones' for range expanding invasive species noting the occasional observed presence of long spined sea urchins in ROV footage. Section 9.5 (this section) has been included in the EP following consideration of these comments.

10 Environmental outcomes, standards and measurement criteria

This Section presents the Environmental Performance Outcomes (EPOs), Environmental Performance Standards (EPSs) and measurement criteria required to manage the impacts and risks identified in Sections 8 and 9 of this EP. Refer to Table 10-1 and Table 10-2.

The following definitions are used in this section, consistent with Regulation 4 of the OPGGS (Environment) Regulations:

- EPO – a measurable level of performance required for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level (i.e. a statement of the environmental objective)
- EPS – a statement of the performance required of a control measure
- Measurement criteria (not defined in the regulations) – defines how environmental performance will be measured to determine whether the EPSs and EPOs have been met.

Table 10-1 Environmental performance – Steel Piled Jacket end states

SPJ end state	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement Criteria
Lower sections of HLA, FTA, CBA, MKA, KFA, KFB, WKF and FLA SPJs (including strut footings where present and foundation piles below the seabed) decommissioned in place – SPJ cut to ensure a minimum 55m clearance below MSL. SPJ footings of WTA and BMA (including foundation piles below the seabed) decommissioned in place - cut as close as practicable to	Physical presence of SPJ lower sections left in place.	Change to the function, interests or activities of other users of the sea.	Prevent interference and adverse interactions with commercial vessels.	**CM1:** Where water depth allows, SPJs to be cut at a depth which is consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989).	Where water depth allows, an unobstructed water column of at least 55m is provided above the SPJ lower sections remaining in place to ensure safety of navigation.	'As left' survey report confirms that where water depth allows, an unobstructed water column of at least 55m has been provided above the SPJ lower sections remaining in place.
				CM2: Locations of remaining SPJ lower sections to be identified on navigational charts administered by the AHO to advise marine users of their ongoing presence.	Notify AHO of the location of remaining SPJ lower sections so these can continue to be marked on navigational charts.	Records show that: • the AHO has been notified of the locations of the SPJ lower sections remaining in place • navigational charts continue to include these locations.
			Minimise interference to commercial and recreational fishing	**CM3:** Removal of the 500m PSZs around the SPJs will provide enhanced access for recreational and commercial fishing opportunities.	Esso will apply to remove the 500m PSZs around the SPJs following the completion of decommissioning execution activities.	Government Gazette confirms PSZs have been removed around the decommissioned SPJs.

SPJ end state	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement Criteria
the seabed (without large scale dredging).	Accidental interaction with commercial fishing vessels.	Change to the function, interests or activities of other users of the sea.	Minimise the risk of adverse interactions with commercial fishing vessels.	**CM2:** Locations of remaining SPJ lower sections to be identified on navigational charts administered by the AHO to advise marine users of their ongoing presence.	Notify AHO of the location of remaining SPJ lower sections so these can continue to be marked on navigational charts.	Records show that: • the AHO has been notified of the locations of the SPJ lower sections remaining in place. • navigational charts continue to include these locations.
				CM4: Update plotter files for commercial fishing vessels active in the OAs.	Esso will engage with SETFIA and individual fishing operators to identify relevant commercial fishing vessels and offer to update plotter files.	Relevant person consultation records reflect engagement with commercial fishing vessel operators to update plotter files.
			Mitigate the impacts of adverse interactions with commercial fishing vessels, in the event that an interaction occurs.	**CM5:** The current model for compensation for claims of equipment damage as a result of interaction with Esso facilities, the Fisherman's Tribunal, will remain in place, until such time as all Bass Strait operations are no longer producing.	The Fisherman's Tribunal is an existing compensation process and will continue to be implemented until all Bass Strait operations are no longer producing.	Records of Fisherman's Tribunal meetings verify this process remains in place.

SPJ end state	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement Criteria
				CM6: Esso to continue to investigate frameworks used to compensate commercial fishers in other jurisdictions and whether such frameworks might be suited to Bass Strait.	Esso to undertake a review of compensation schemes implemented in other jurisdictions, which will include consultation with commercial fishing Relevant persons, and document the compensation arrangements proposed for the period after all Bass Strait operations are no longer producing.	Records show the outcomes of the review of compensation schemes.
Lower sections of HLA, FTA, CBA, MKA, KFA, KFB, WKF and FLA SPJ's (including strut footings where present and foundation piles below the seabed) decommissioned in place – SPJ's cut to ensure a minimum 55m clearance below MSL.	Benefits of SPJ lower sections being retained in place.	Retention of the species abundance/diversity observed on the SPJs.	Further verify the assessed value of retaining SPJ lower sections in place.	**CM7:** Undertake Environmental Survey 2 (Winter) in 2022 to investigate if there are any significant seasonal or temporal variations in species assemblages, as compared to the Environmental Survey 1 (Summer) undertaken in 2021.	Environmental Survey 2 (Winter) will be undertaken in 2022 and this EP will be reviewed following receipt of results. If significant changes to the impacts and risks assessed in this EP are identified as a result of this review, this EP will be revised and resubmitted.	Records show EP was reviewed (and revised if necessary) following receipt of results of the environment survey 2 (winter).
SPJ footings of WTA and BMA (including foundation piles below the		Retention of Gippsland Basin ecosystem richness and diversity as a result of structures		**CM8:** Undertake a connectivity study to further understand the role of the SPJs as	Connectivity study is undertaken and this EP will be reviewed following receipt of results. If significant changes to the impacts and	Connectivity study report demonstrates the study has been completed. Records show review of EP undertaken.

SPJ end state	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement Criteria
seabed) decommissioned in place - cut as close as practicable to the seabed (without large scale dredging).		contributing to productivity and connectivity (cumulative impacts).		settlement habitat or source population for larvae of fishes and benthic organisms which utilise oceanic currents for dispersal and connectivity within the Gippsland Basin.	risks assessed in this EP are identified as a result of this review, this EP will be revised and resubmitted.	
				CM9: Undertake a productivity study to further understand the contribution of the SPJs (under the proposed decommissioning end states) to secondary fish production within the Gippsland Basin region.	Productivity study is undertaken and this EP will be reviewed following receipt of results. If significant changes to the impacts and risks assessed in this EP are identified as a result of this review, this EP will be revised and resubmitted.	Productivity study report demonstrates the study has been completed. Records show review of EP undertaken.
	Long term degradation of SPJ lower sections remaining in place.	Injury/mortality to fauna. Change in habitat.	Limit the impacts to marine fauna and habitats as a result of the long-term degradation	**CM10:** Sections of the SPJs which contain (or are coated with) contaminants will be removed for onshore	SPJ sections that contain (or are coated with) contaminants such as splash zone coatings and integrated jacket leg tanks that have previously been used for hydrocarbon storage will not be decommissioned in place.	'As left' survey report following decommissioning execution confirms upper SPJ sections have been removed.

SPJ end state	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement Criteria
			of SPJ lower sections remaining in place.	dismantling and disposal.		

Table 10-2 Environmental performance – Disposal options for removed sections of jacket

Disposal option	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement criteria
Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs - cut to ensure a minimum 55m clearance below MSL.	Ongoing physical presence of removed SPJ sections placed on the seabed.	Change to the function, interests or activities of other users of the sea.	Prevent interference and adverse interactions with commercial vessels.	**CM11:** Removed SPJ sections placed on the seabed will be cut so as to ensure clearance is consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989).	An unobstructed water column of at least 55m is provided above any removed SPJ sections placed on the seabed to ensure safety of navigation.	'As left' survey report following decommissioning execution confirms an unobstructed water column of at least 55m has been provided above any removed SPJ sections placed on the seabed.
				CM12: Locations of removed SPJ sections placed on the seabed will be identified on navigational charts to advise other users of their presence.	Notify AHO of locations of removed SPJ sections placed on the seabed so these can continue to be marked on navigational charts.	Records show that: • the AHO has been notified of the locations of the removed SPJ sections placed on the seabed; • navigational charts continue to include these locations.

Disposal option	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement criteria
			Minimise ongoing interference to commercial fishing operations.	**CM13:** Removed sections of SPJs will be placed on the seabed as close as practicable to the lower SPJ sections remaining in place.	Removed SPJ sections placed on the seabed will be placed as close as practicable to the SPJs to minimise the footprint of the seabed unavailable for commercial fishing operations. 'As close as practicable' will be assessed and documented in a 'Seabed Placement' location assessment.	'As left' survey confirms removed SPJ section(s) are placed on the seabed in accordance with the Seabed Placement location assessment.
Placement on the seabed of some removed section(s) of HLA, CBA, MKA, KFA, KFB, WKF and FLA SPJs - cut to ensure a minimum 55m clearance below MSL.	Accidental interaction with commercial fishing vessels.	Change to the function, interests or activities of other marine users.	Minimise the risk of adverse interactions with commercial fishing vessels.	**CM12:** Locations of removed SPJ sections placed on the seabed will be identified on navigational charts to advise other users of their presence.	Notify AHO of locations of removed SPJ sections placed on the seabed so these can continue to be marked on navigational charts.	Records show that: • the AHO has been notified of the locations of the removed SPJ sections placed on the seabed; • navigational charts continue to include these locations.
				CM4: Update plotter files for commercial fishing vessels active in the OAs.	Esso will engage with SETFIA and individual fishing operators to identify relevant commercial fishing vessels and offer to update plotter files.	Relevant person consultation records reflect engagement with commercial fishing vessel operators to update plotter files.

Disposal option	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement criteria
			Mitigate the impacts of adverse interactions with commercial fishing vessels, in the event interaction occurs.	**CM5:** The current model for compensation for claims of equipment damage as a result of interaction with Esso facilities, the Fisherman's Tribunal, will remain in place, until such time as all Bass Strait operations are no longer producing.	The Fisherman's Tribunal is an existing compensation process and will continue to be implemented until all Bass Strait operations are no longer producing.	Records of Fisherman's Tribunal verify this process is ongoing.
				CM6: Esso to continue to investigate frameworks in other jurisdictions used to compensate commercial fishers and whether such frameworks might be suited to Bass Strait.	Esso to undertake a review of compensation schemes implemented in other jurisdictions, which will include consultation with commercial fishing relevant persons, and document the compensation arrangements proposed for the period after all Bass Strait operations are no longer producing.	Records show the outcomes of the review of compensation schemes.
	Long term degradation of removed SPJ sections placed on the seabed.	Injury/mortality to fauna and change in habitat.	Limit the impacts to marine fauna and habitats as a result of the long-term	**CM14:** Sections of the SPJs which contain (or are coated with) contaminants will be removed for onshore dismantling and	SPJ sections that contain (or are coated with) contaminants such as splash zone coatings and integrated jacket leg tanks that have previously been used for hydrocarbon	'As left' survey report confirms upper SPJ sections have been removed for onshore disposal.

Disposal option	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement criteria
			degradation of removed SPJ sections placed on the seabed adjacent to the lower sections of the SPJs.	disposal and not placed on the seabed.	storage will not be placed on the seabed.	
Onshore dismantling and disposal of removed sections of SPJs*. Onshore dismantling and disposal of removed sections of SPJs*.	Transport of the sections of SPJs via vessel to an ORC.	Interference with other marine users. Impacts to marine fauna as a result of underwater noise from vessels. Injury, harm or interference to marine mammals. Combustion and greenhouse gas emissions, leading to localised decline in air quality and contributions to change in climate. Planned vessel discharges such as bilge/drain water, cooling	Impacts and risks as a result of onshore dismantling and disposal of removed sections of SPJs to an ORC are identified and managed.	**CM15:** Ensure removal/disposal contracting requirements include provision that all applicable legislation and relevant guidelines required to transport the SPJ sections from the title area to the designated ORC location are identified, and complied with.	Contracting requirements will include provisions to ensure potential environmental impacts and risks relating to transport of SPJ sections removed from title areas are identified and managed.	Removal/disposal contract(s) demonstrate inclusion of this provision.

Disposal option	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement criteria
		water, sewage/grey water and food waste. Unplanned vessel discharges as a result of spills.				
	Dismantling of the removed sections of SPJs and cleaning of marine growth at an ORC.	Nuisance impacts such as odour, noise, increased traffic or air emissions. Impacts to the environment as a result of spills or discharges to water, land or air.		**CM16**: Ensure removal/disposal contracting requirements include provision that all applicable approvals, permits and consents required to establish and operate the ORC are identified and complied with.	Contracting requirements will include provisions to ensure potential environmental impacts and risks related to activities at the ORC are identified and managed.	Removal/disposal contract(s) demonstrate inclusion of this provision.
				CM17: Ensure removal/disposal contracting requirements include the development and implementation of appropriate ORC environmental management plans.	Contracting requirements will include provisions to ensure potential environmental impacts and risks related to activities at the ORC are identified and managed.	Removal/disposal contract(s) demonstrate inclusion of this provision.
	Onshore disposal/recycling of dismantled SPJ sections.	Pressure on local landfills. Air, water and land pollution.		**CM18:** Ensure disposal contracting requirements include identifying and complying with all	Contracting requirements will include provisions to ensure potential environmental impacts and risks related to disposal of	Disposal contract(s) demonstrate inclusion of this provision.

Disposal option	Aspect	Impact	EPOs	Control Measure	EPSs	Measurement criteria
				relevant legislation governing waste management and disposal in the onshore jurisdiction(s) within which disposal activities will take place.	waste streams generated as a result of the removal of SPJ sections from the title areas are identified and managed.	
				CM19: Develop a waste management strategy in conjunction with removal/disposal contractors which incorporates consideration of the waste hierarchy.	Waste management strategy will be developed to ensure that resource recovery from the removed SPJ sections is maximised and disposal of material to landfill is minimised as far as practicable.	Waste management strategy developed.

* The impacts and risks associated with the execution of the removed jacket sections disposal will be assessed in more detail in the future Campaign #1 – End State Execution EP/s.

11 Implementation strategy

11.1 Environment Management System Overview

The OPGGS (Environment) Regulations 14(3) requires that the implementation strategy must contain a description of the Environmental Management System (EMS) for the activity, including specific measures to be used to ensure that:

- the environmental impacts and risks of the activity continue to be identified and reduced to a level that is ALARP
- control measures detailed in the environment plan are effective in reducing the environmental impacts and risks of the activity to ALARP and an acceptable level
- EPO and standards set out in the EP are being met.

As outlined in Section 1.2, the activity covered in this EP is to gain acceptance of the proposed end states for the SPJs listed in Section 1.1. As such, there are no execution activities within the scope of this EP. Activities to execute the SPJ end states and the monitoring activities proposed in Section 11.1 will be covered in the future Campaign #1 – End State Execution EP/s.

The EMS is the method by which the environmental impacts and risks outlined in this EP are managed to ensure they are reduced to ALARP and an acceptable level, for the duration of this EP, and until such time as the relevant petroleum titles are surrendered. The Esso EMS is called OIMS. Lloyd's Register Quality Assurance Inc. has assessed OIMS and concluded that it is consistent with the intent and meets the requirements of ISO 14001 (Environmental Management Systems).

OIMS comprises of a number of separate systems each designed to meet specific expectations, which are set out within a framework of 11 separate elements. ExxonMobil's OIMS Framework (Figure 11-1) establishes common worldwide expectations for addressing risks inherent in the business. The term Operations Integrity is used by ExxonMobil to address all aspects of its business that can impact personnel and process SSHE performance.

The 11 elements of OIMS interact within a hierarchy as shown in Figure 11-1. The visible leadership and commitment of management required by Element 1 is the driver for the effective implementation of OIMS. Elements 2 to 10 provide the operations of OIMS to control the hazards associated with Esso's activities. Element 11 provides evaluation of the effective implementation of Elements 1 to 10 through a process of periodic audits and assessments. Element 11 also drives the continuous improvement feedback loop within OIMS.

Figure 11-1 Operations Integrity Management System Framework

The aspects of OIMS that are relevant to the scope of this EP are described in further detail in the following sections.

11.2 Environmental Management (OIMS System 6-5)

OIMS System 6-5: Environmental Management (part of OIMS Element 6: Operations and Maintenance), specifically addresses corporate requirements for environmental management, including socioeconomic and community health aspects. This includes the fundamental requirement to develop EMSs which identify and assess all environmental aspects, impacts and risks associated with Esso's activities. The EMSs must also describe how the impacts and risks are addressed and controlled. This EP meets the System 6-5 requirement for an EMS to assess the environmental aspects, impacts and risks associated with the proposed end state concepts for the Campaign #1 SPJs.

11.3 Compliance with Laws, Regulations and Permits (OIMS System 4-2)

OIMS System 4-2: Compliance with Laws, Regulations and Permits (part of OIMS Element 4: Information/Documentation), addresses regulatory compliance activities for the SPJ end states. Several mechanisms are in place to identify new or amended regulatory requirements or information that may have an impact on this EP:

- engagement with government agencies and review of government publications of laws and regulations
- participation in government-sanctioned working committees
- active participation in industry organisations or cooperatives e.g. APPEA, Centre of Decommissioning Australia, National Decommissioning Research Initiative
- Active participation in local or international trade organisations
- Subscriptions to specialist consultants, commercial publications and government provided subscriptions (e.g. SAI Global, Environment Essentials, COMLAW).

New, amended or existing regulatory requirements are identified and evaluated in accordance with the process outlined in Section 11.4.

11.4 Management of Change (OIMS System 7-1)

Esso have in place an environmental Management of Change process that ensures changes to this EP are assessed. The assessment has been developed to align with NOPSEMAs guidance on when a change is likely to trigger the requirement to submit a proposed revision of an EP. Its criteria is based on *When to submit a proposed revision of an EP* (NOPSEMA, 2020d).

As soon as a change from the information presented in this EP has been identified (such as when data from additional studies currently underway becomes available), an assessment of this EP will be undertaken. A revision of the EP will be required under OPGGS (Environment) Regulations 17 in the event that the proposed change or new information:

- constitutes a new stage or significant modification, or
- introduces a significant new environmental impact or risk, or
- significantly increases an existing environmental impact or risk.

The environmental Management of Change process also considers the following:

- OPGGS (Environment) Regulations 17(1) – New activity
- OPGGS (Environment) Regulations 8 – Significant new or increased environmental impact or risk
- OPGGS (Environment) Regulations 14(3)(a) – Have the impacts and risks been reduced to as low as reasonably practicable
- OPPGS Act, Section 572 – Maintenance and removal or property etc. by titleholder.

Minor identified changes (which do not trigger a resubmission under the OPGGS (Environment) Regulations may result in administrative updates to this EP which are documented in a change register. Records of these assessment are stored on file.

11.5 Roles and responsibilities

As required by OPGGS (Environment) Regulations 14(4), this section sets out the roles and responsibilities of personnel in relation to the implementation, management and review of this EP.

11.5.1 OIMS Management Committee

The OIMS Management Committee has overall accountability for the implementation, execution and continuous improvement of OIMS within Esso.

Key responsibilities of the OIMS Management Committee include:

- demonstrate commitment to OIMS through active and visible participation in OIMS implementation, execution and improvement
- ensure that Annual System Reviews are conducted
- review key Operations Integrity performance indicators that show the status and effectiveness of OIMS implementation and execution

- periodically review Operations Integrity incidents for learning and continuous improvements to OIMS.

11.5.2 Environment Plan key roles and responsibilities

Key roles and responsibilities for Esso personnel relating to implementing, managing and reviewing this EP are described in Table 11-1.

Table 11-1 Key roles and responsibilities

Roles	Responsibilities
Project Manager SSHE Manager Technical and Execution Leads/Supervisors	• Hold personnel accountable for ensuring the EPOs and EPSs outlined in this EP are complied with.
Environment and Regulatory Lead/Supervisor	• Ensure any breaches of the EPOs and EPSs outlined in this EP are reported, investigated and rectified per the requirements of this EP. • Ensure personnel with a role in this EP undertake appropriate training and awareness sessions. • Ensure ongoing engagement with government agencies and other external relevant persons. • Liaise with regulatory authorities as required.
Environment and Regulatory Advisor	• Communicate EP obligations to relevant personnel. • Track and report compliance with EPOs and EPSs as per the requirements of this EP. • Ensure environmental reporting is undertaken as per the requirements of this EP. • Assess any new information (such as environmental survey results) against the impact and risk assessments in this EP, and revise EP if required.
Stakeholder Engagement Advisor	• Facilitate ongoing engagement with relevant persons as outlined in Section 6 of this EP. • Maintain the Gippsland-wide relevant person database to document relevant person consultation on the SPJ end states.

11.6 Training and awareness

OPGGS (Environment) Regulation 14(5) requires that the implementation strategy must include measures to ensure that each employee and contractor working on, or in connection with, the activity is aware of their roles and responsibilities in relation to the EP.

All personnel with a role in this EP will be made aware of the SPJ end states and all EPOs and EPSs and commitments made in the EP relating to their area of work and that a breach of any EOP or EPS constitutes a recordable environmental incident.

11.7 Monitoring of environmental performance

In accordance with OPGGS (Environment) Regulation 14(6) the implementation strategy must include monitoring, recording, audit, management of non-conformance and review of environmental performance and the implementation strategy to ensure that the EPOs and EPSs included in Section 10 of this EP are being met.

11.7.1.1 Monthly review of this Environmental Plan

Esso will undertake a monthly review of the EPOs and the EPSs in this EP to ensure they are being met. This review is recorded and if there are any breaches of EPOs or EPSs, these are detailed and provided to NOPSEMA through the monthly recordable incident report.

11.7.1.2 Audits, assessments and inspections

Environmental performance assurance will be undertaken to ensure that:

- controls are implemented in accordance with EPSs to achieve the EPOs included in Section 10 of this EP
- non-compliances and opportunities for improvement are identified
- environmental reporting requirements are met.

Esso will undertake audits against this EP periodically and as appropriate to the scope of this EP, which will consist of desktop audits. The objective of the audits will be to verify that EPOs and EPSs are being implemented.

11.8 Reporting

11.8.1 Routine environmental performance reporting

The OPGGS (Environment) Regulation 14(2) states that the implementation strategy must:

- state when the titleholder will report to the Regulator in relation to the titleholder's environmental performance for the activity
- provide that the interval between reports will not be more than one year.

Regulation 26C of the OPGGS (Environment) Regulations requires the reporting of environmental performance of this EP. The routine reporting requirements required for this EP are described in Table 11-2.

Table 11-2 Routine Environment Plan reporting requirements

Requirement	Timing	Contact
Submit an annual EP environmental performance report to NOPSEMA	The annual EP environmental performance report for each calendar year this EP is in force (January to December) will be submitted to NOPSEMA by the end of February of the following year.	NOPSEMA submissions@nopsema.gov.au
Notification of start and end of activity	Not required.	

Requirement	Timing	Contact
	There are no execution activities associated with this EP.	
End of EP notification	In accordance with Regulation 25A of the OPGGS (Environment) Regulations Esso shall notify NOPSEMA via the appropriate submission form within 10 days of completion of this EP. As outlined in Section 1.2, this EP will end once: • all obligations under this EP have been completed, or • the future Campaign #1– End State Execution EP/s is accepted.	

11.8.2 External incident notification and reporting

The OPGGS (Environment) Regulations define '*recordable incidents*' and '*reportable incidents*' and also describe reporting requirements for each type of incident. The reporting requirements under the OPGGS (Environment) Regulations are managed under OIMS System 4-2: Compliance with Laws Regulations and Permits. Incidents are managed internally in accordance with OIMS System 9-1: Incident Management to ensure valuable information and lessons learned are available to prevent the recurrence of similar incidents.

Reportable incidents are those that have caused, or have the potential to cause, moderate to significant environmental damage. Reportable incidents are not relevant to this EP - as this EP is seeking acceptance of the proposed end state concepts for the Campaign #1 SPJs and does not include any execution activities.

A recordable incident means a breach of an EPO or EPS in the EP that is not a reportable incident. Refer Table 11-3.

Table 11-3 Recordable incident reporting

Requirement	Timing	Contact
In accordance with Section 26B(4) of the OPGGS (Environment) Regulations, submit a written monthly recordable incident report, to include the following: • all recordable incidents which occurred during the calendar month • all material facts and circumstances concerning	As soon as possible but before the 15th day of the following calendar month.	NOPSEMA submissions@nopsema.gov.au

Requirement	Timing	Contact
the incident(s) that the titleholder knows or is able, by reasonable search or enquiry, to find out • any action taken to avoid or mitigate any adverse environmental impacts of the recordable incidents; and • the action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future. The NOPSEMA Recordable Environmental Incident Form (ref N03000-FM0928 198750) will be used to submit the monthly recordable incident report.		

11.9 Oil Pollution Emergency Plan

In accordance with OPGGS (Environment) Regulations 14(8) and 14(8A-8E), the implementation strategy must contain an Oil Pollution Emergency Plan (OPEP) and provide for updating the plan, and include arrangements for testing the response arrangements in the OPEP and monitoring of impacts to the environment from oil pollution and response activities.

There is no credible spill risk for the activities within the scope of this EP - as this EP is seeking acceptance of the proposed end state concepts for the Campaign #1 SPJs and does not include any execution activities. Well P&A activities associated with the SPJ end states will be undertaken in accordance with the Well Operations Management Plan and relevant EPs as outlined in Table 1-1 of this EP. As such, an OPEP has not been developed for inclusion in this implementation strategy.

11.10 Relevant Person consultation

In accordance with OPGGS (Environment) Regulation 14(9), the implementation strategy must provide for appropriate consultation with relevant authorities of the Commonwealth, a state or territory and other relevant interested persons or organisations.

Relevant person consultation in relation to the activities included within this EP has been undertaken and is discussed in Section 6 of this EP.

11.11 Liability arrangements for infrastructure remaining in place

11.11.1 Legislated liability arrangements

The OPGGS Act provides NOPSEMA with the power to direct titleholders to remove any infrastructure that remains in place via:

- Withdrawal of acceptance of this EP, subject to the grounds specified in the OPGGS (Environment) Regulations r.23;
- NOPSEMA issue of a general direction to Esso as titleholder, pursuant to the OPGGS Act s.574;
- NOPSEMA issue of a remedial direction to Esso as titleholder, pursuant to the OPGGS Act s.586;
- NOPSEMA issue of a remedial direction to Esso as a former titleholder, pursuant to the OPGGS Act s.587.

In addition, in order for the Joint Authority to consent to eventual title surrender, Esso is required to comply with the criteria outlined in Section 270 of the OPGGS Act and NOPSEMA will provide advice to the Joint Authority as to titleholder compliance with Section 270 clauses (3)(b)(iii) & (v) and 270 (3) (c) to (f).

11.11.2 Fishing industry compensation arrangements

Section 9.3 of this EP evaluates the risk of an unplanned interaction between the infrastructure remaining in place and a commercial fishing vessel. The overall risk of this occurring was assessed to be **Category 3 (Medium)**. Controls will be implemented to ensure the risk of interaction with a fishing vessel is reduced to ALARP and acceptable levels (refer to Section 10). In the event an unplanned interaction between a commercial fishing vessel and the infrastructure remaining in place does occur, Esso has existing processes in place to ensure any socioeconomic impacts of this interaction are mitigated.

Commercial fishers have requested information as to the ongoing compensation/liability arrangements that would be in place in the event of infrastructure remaining in place. Esso continues to engage with the commercial fishing industry in order to develop the most appropriate mechanism to address any impacts to the commercial fishing industry as a result of operations or decommissioning.

A six-monthly meeting occurs between Esso and the commercial fishing industry to negotiate compensation claims (Fisherman's Tribunal). A fisheries subject matter expert also attends the meeting together with fisheries claimants. The most recent Tribunal meeting took place in July 2022. This Fisherman's Tribunal will continue to function until such time as all Bass Strait operations are no longer producing.

Esso is currently considering options for managing compensation claims for the period after the Bass Strait operations are no longer producing. A review is being undertaken of two schemes currently operating in the U.K. sector of the North Sea, being the:

- Oil & Gas UK Fishermen's Compensation Fund
- UK Fisheries Offshore Oil and Gas Legacy Trust Fund Limited.

The UK Fishermen's Compensation Fund provides a process similar to the Fishermen's Tribunal (established by Esso), where the purpose of the fund is to provide a means of redress to fishers who have suffered loss or damage to fishing equipment caused by oil and gas infrastructure.

The UK Legacy Trust Fund provides a model for a self-sustaining trustee-managed entity in the oil and gas industry. Its primary objective is to enhance the safety of fishermen in UK waters by ensuring the provision of information about oil and gas related sea-bed structures which might affect fishing. Its secondary objective is to support projects which help preserve the UK fishery or help manage issues relating to oil and gas infrastructure after decommissioning or cessation of activities.

More work will be undertaken to identify and develop a framework that is suitable for Bass Strait fishing compensation claims that may arise after all Bass Strait operations are no longer producing, which is not anticipated until after 2030. Having received feedback from the predominant commercial fishing industry association in Bass Strait and the local elected federal representative, Esso, the industry association and the existing Fishermen's Tribunal have all agreed that it is too early to consider any detailed changes to fishing industry compensation arrangement, and that the existing Fishermen's Tribunal will continue to address fishing compensation claims.

11.12 Post-decommissioning monitoring

In accordance with OPGGS (Environment) Regulations r.14(7) the implementation strategy must provide for sufficient monitoring of emissions and discharges, such that the records can be used to assess whether the EPOs and EPSs in the EP are being met. This EP is seeking acceptance of the proposed end states for the Campaign #1 SPJs and does not include any execution, or 'in the field' activities. Hence, monitoring of emissions and discharges during the activity is not applicable to this EP.

This Section provides an overview of the proposed post-decommissioning monitoring for the proposed SPJ end states (SPJ lower sections, and some removed sections of the SPJs that may be placed on the seabed). The activities to execute these proposed monitoring activities will be included in the future Campaign #1 – End State Execution EP/s, or subsequent EPs as required.

When determining the proposed post-decommissioning monitoring, Esso has considered:

- the outcomes of the environmental impact and risk assessments presented in this EP
- the monitoring and survey expectations outlined in Section 270 Consent to surrender title (NOPSEMA, 2022a)
- a review of international and Australian post-decommissioning monitoring precedence.

In the United Kingdom, post-decommissioning monitoring is required to (Department for Business, Energy & Industrial Strategy, 2018):

- confirm that decommissioning has been implemented in accordance with the terms of the decommissioning programs
- identify and recover any debris or other obstructions on the seabed, followed by verification the area is clear and fishing over trawl surveys (if applicable)
- consider monitoring objectives on a case-by-case basis such as where there is significant contamination in the vicinity of an installation, or when infrastructure remaining in-situ needs to be monitored to assess its condition, colonisation by marine organisms or the potential risk to fishing operations

Where it is determined that post-decommissioning monitoring is required, the scope of such monitoring is agreed in consultation with the Regulator.

The proposed post-decommissioning monitoring of the Campaign #1 SPJs is outlined in Section 11.12.1 and 11.12.2.

11.12.1 'As left' survey(s)

'As left' post-decommissioning survey(s) will be undertaken to:

- confirm the SPJs have been decommissioned in accordance with the proposed SPJ end states; and
- identify any remaining items or debris that may be present.

The 'as left' survey(s) will be undertaken following the completion of decommissioning Campaign #1 execution activities, and prior to the commencement of decommissioning Campaign #2.

11.12.2 Monitoring of infrastructure remaining in place

Post decommissioning monitoring will be undertaken to evaluate any impacts to the ecosystem which exists on and around the SPJs and which would be partially retained under the proposed end states. Until the upper sections of the SPJs are removed, environmental studies or monitoring to support the assessment of any impact to the biota and remaining habitat cannot be undertaken. There is little available information in literature which provides estimates or measurement of the level of change that can be expected.

To undertake monitoring of the remaining infrastructure, Esso is investigating the aspects below and will develop a comprehensive monitoring plan based on these, which will be detailed in the Campaign #1 – End State Execution EP/s:

- assessment of changes in the energy flow (through the multiple trophic levels which exist) to the SPJ epibenthic community - by evaluating changes in detrital deposition (energy flow from the upper water column regions) to the ecosystem remaining after the upper section removal has been completed.
- assessment of the diversity and abundance of the species on any remaining bottom sections along with any placed upper sections, and comparison with reference sites which have been surveyed in the offshore environmental surveys #1 and #2 (Summer and Winter) undertaken in 2021/2022.
- analysis of the biodiversity and abundance of species on the infrastructure remaining to assess the presence of any invasive marine species and if observed, assess any detrimental impacts from these species to the communities on the structures.
- assessment of the importance of the remaining infrastructure in maintaining or expanding the communities identified, based on the results of the connectivity and productivity studies currently being undertaken.

Monitoring will provide important information on the status of the post-decommissioning ecological communities and provide information to support the criteria for title surrender as per Section 270(e) and (f)[1] of the OPGGS Act.

[1] Section 270 (e) requires that the registered holder of the permit, lease or licence has provided, to the satisfaction of NOPSEMA, for the conservation and protection of the natural resources in the PSer area. Section 270 (f) requires that the registered holder of the permit, lease or licence has, to the satisfaction of NOPSEMA, made good any damage to the seabed or subsoil in the surrender area caused by any person engaged or concerned in the operations authorised by the permit, lease or licence.

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Appendix A1 Property inventory for proposed Steel Piled Jacket end states

Facility	Title	Year installed	Description	Location (latitude/ longitude)	Distance to shore (km)	Water depth (m)	Maximum height of jacket above seabed at end state (m)	Infrastructure to remain in place following decommissioning	Disposal option #1 Transport all removed SPJ sections for onshore disposal	Disposal option #2 Place selected removed SPJ and strut sections on seabed adjacent to SPJ lower sections. Sections of SPJ and strut which are unsuitable for placement removed for onshore disposal.	Current status (as of May 2023)
Halibut (HLA)	VIC/L05	1968	16-leg SPJ and strut	38° 24' 20" S; 148° 19' 07" E	63	73	18	Lower section of SPJ. Strut footings. 40 piles extending to a maximum penetration of 145m below the seabed.	Top section of SPJ and strut removed to a minimum of 55m below MSL.	Removed section(s) of SPJ and strut placed onto seabed. Top section of SPJ and strut which contain contaminants deemed not suitable for placement removed for onshore disposal.	Producing.
Fortescue (FTA)	VIC/L05	1982	8-leg SPJ	38° 28' 50" S; 148° 20' 28" E	62	69	14	Lower section of SPJ. 16 piles extending to a maximum penetration of 102m below the seabed.	Top section of SPJ removed to a minimum of 55m below MSL.	Option not applicable due to water depth.	Ceased production in 2020. Wells not yet P&A'd.
Cobia (CBA)	VIC/L05	1982	8-leg SPJ	38° 24' 32" S; 148° 16' 36" E	68	78	23	Lower section of SPJ. 16 piles extending to a maximum penetration of 102m below the seabed.	Top section of SPJ removed to a minimum of 55m below MSL.	Removed section(s) of SPJ placed onto seabed. Top section of SPJ which contain contaminants deemed not suitable for placement removed for onshore disposal.	Producing.
Mackerel (MKA)	VIC/L05	1976	8-leg SPJ	38° 27' 04" S; 148° 18' 28" E	72	93	38	Lower section of SPJ. 16 piles extending to a maximum penetration of 102m below the seabed.	Top section of SPJ removed to a minimum of 55m below MSL.	Removed section(s) of SPJ placed onto seabed. Top section of SPJ which contain contaminants deemed not suitable for placement removed for onshore disposal.	Ceased production in 2015. Wells P&A'd in 2021.
Kingfish A (KFA)	VIC/L07	1969	8-leg SPJ and strut	38° 35' 51" S; 148° 08' 35" E	75	77	22	Lower section of SPJ. Strut footings. 20 piles extending to a maximum penetration of 156m below the seabed.	Top section of SPJ and strut removed to a minimum of 55m below MSL.	Removed section(s) of SPJ and strut placed onto seabed. Top section of SPJ and strut which contain contaminants deemed not suitable for placement removed for onshore disposal.	Ceased production in 2015. Wells not yet P&A'd.
Kingfish B (KFB)	VIC/L07	1969	8-leg SPJ and strut	38° 35' 54" S; 148° 11' 11" E	77	78	23	Lower section of SPJ. Strut footings. 20 piles extending to a maximum of 156m below the seabed.	Top section of SPJ and strut removed to a minimum of 55m below MSL.	Removed section(s) of SPJ and strut placed onto seabed. Top section of SPJ and strut which contain contaminants deemed not suitable for placement removed for onshore disposal.	Ceased production in 2019. Wells P&A'd in 2021.

Facility	Title	Year installed	Description	Location (latitude/ longitude)	Distance to shore (km)	Water depth (m)	Maximum height of jacket above seabed at end state (m)	Infrastructure to remain in place following decommissioning	Disposal option #1 Transport all removed SPJ sections for onshore disposal	Disposal option #2 Place selected removed SPJ and strut sections on seabed adjacent to SPJ lower sections. Sections of SPJ and strut which are unsuitable for placement removed for onshore disposal.	Current status (as of May 2023)
West Kingfish (WKF)	VIC/L07	1981	8-leg SPJ	38° 35' 39" S; 148° 06' 15" E	72	76	21	Lower section of SPJ. 16 piles extending to a maximum of 103m below the seabed.	Top section of SPJ removed to a minimum of 55m below MSL.	Removed section(s) of SPJ placed onto seabed. Top section of SPJ which contain contaminants deemed not suitable for placement removed for onshore disposal.	Producing.
Flounder (FLA)	VIC/L11	1983	8-leg SPJ	38° 18' 44" S; 148° 26' 16" E	58	93	38	Lower section of SPJ. 16 piles extending to a maximum of 122m below the seabed.	Top section of SPJ removed to a minimum of 55m below MSL.	Removed section(s) of SPJ placed onto seabed. Top section of SPJ which contain contaminants deemed not suitable for placement removed for onshore disposal.	Ceased production in 2020. Wells not yet P&A'd.
Bream A (BMA)	VIC/L13	1987	8-leg SPJ	38° 30' 03" S; 147° 46' 15" E	46	59	~3-5	SPJ footings. 12 piles extending to a maximum of 107m below the seabed.	SPJ removed to as close as practicable to the seabed.	Option not applicable due to water depth.	Ceased production in 2020. Wells not yet P&A'd.
Whiting (WTA)	VIC/L02	1989	4-leg SPJ	38° 14' 29" S; 147° 72' 20" E	34	54	~3-5	SPJ footings. 4 piles extending to a maximum of 85m below the seabed.	SPJ removed to as close as practicable to the seabed.	Option not applicable due to water depth.	Oil production ceased in 1997. Gas production declared unviable in 2019. Wells P&A'd in 2020

Appendix A2 Weight breakdown for proposed Steel Piled Jacket end states (estimates)

Facility	Description	Total mass to remain	Mass to remain above seabed			Mass to remain below seabed		Disposal option #1 Transport all removed SPJ sections for onshore disposal			Disposal option #2 Place selected SPJ sections and strut on seabed adjacent to SPJ lower sections (top sections unsuitable for placement to be transported onshore)					
								Mass to be transported for onshore disposal			Mass to be removed and transported onshore			Mass to be placed on seabed		
		All materials (MT)	Steel (MT)	Grout (MT)	Anode (MT)	Steel (MT)	Grout (MT)	Steel (MT)	Grout (MT)	Anode (MT)	Steel (MT)	Grout (MT)	Anode (MT)	Steel (MT)	Grout (MT)	Anode (MT)
HLA	SPJ, strut and strut footings	4407	2035	127	0	1788	457	2914	0	0	477	0	0	2437	0	0
FTA	SPJ	4137	904	259	1	876	2097	3286	259	4	Option not applicable due to insufficient water depth.					
CBA	SPJ	5633	1970	503	2	1054	2104	2450	0	4	1424	0	1	1027	0	1
MKA	SPJ	5110	2204	502	6	847	2001	2662	0	8	2297	0	7	365	0	1
KFA	SPJ, strut and strut footings	4593	1635	92	0	2199	667	2122	0	0	346	0	0	1776	0	0
KFB	SPJ, strut and strut footings	4597	1642	92	0	2199	664	2066	0	0	336	0	0	1730	0	0
WKF	SPJ	4662	1872	496	3	884	1410	2630	0	4	1528	0	2	1103	0	1
FLA	SPJ	6227	2332	587	47	1030	2231	2874	0	5	1929	0	12	937	0	0
BMA	SPJ	2485	614	183	1	857	830	3802	183	5	Option not applicable due to insufficient water depth.					
WTA	SPJ	1096	336	22	3	335	400	1257	83	0	Option not applicable due to insufficient water depth.					

1. Estimates include SPJ, struts and strut footings. Weight does not include allowance for the marine growth present on the SPJ.
2. ‘Total mass to remain’ includes above seabed and below seabed estimates under proposed end states. This mass does not include seabed placement of any sections of SPJs.
3. Grout estimates for ‘remain below seabed’ are based on as-built pile arrangements drawings. Grout estimates do not include any additional grout flow not documented on the as-built drawings.
4. For anodes on FTA, CBA, MKA, WKF, FLA, BMA - maximum remaining anode material has been assumed at 25% from installation.
5. For anodes on WTA. Assume 90% of anode material remaining.
6. HLA, KFA, KFB - no sacrificial anodes.
7. MT = metric tonnes.

Appendix A3 Adopted steel composition and estimated maximum remaining mass above seabed by Steel Piled Jacket and placed sections

Facility		HLA		FLA		CBA		MKA		KFA		KFB		WKF		FTA	BMA	WTA
Maximum relative portion of SPJ based on proposed end states (MT)[1]		Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Retained above seabed	Retained above seabed
Estimated mass of steel		2,035	2,437	2,332	937	1,969	1,026	2,204	365	1,635	1,776	1,642	1,730	1,872	1,102	903	614	316
Constituent	Wt %[2]	Maximum mass of steel constituent remaining above seabed under proposed end states (MT)[3]																
Carbon	0.25	5.09	6.09	5.83	2.34	4.92	2.57	5.51	0.91	4.09	4.44	4.10	4.32	4.68	2.76	2.26	1.54	0.79
Chromium	1	20.35	24.37	23.32	9.37	19.69	10.26	22.04	3.65	16.35	17.76	16.42	17.30	18.72	11.02	9.03	6.14	3.16
Copper	0.45	9.16	10.97	10.49	4.22	8.86	4.62	9.92	1.64	7.36	7.99	7.39	7.78	8.43	4.96	4.06	2.76	1.42
Iron	98	1994.71	2388.48	2285.11	918.68	1929.95	1005.84	2160.24	357.65	1602.46	1740.12	1608.93	1695.13	1835.01	1080.22	885.21	601.75	310.04
Manganese	1.5	30.53	36.56	34.98	14.06	29.54	15.40	33.06	5.47	24.53	26.63	24.63	25.95	28.09	16.53	13.55	9.21	4.75
Nickel	0.5	10.18	12.19	11.66	4.69	9.85	5.13	11.02	1.82	8.18	8.88	8.21	8.65	9.36	5.51	4.52	3.07	1.58
Phosphorous	0.15	3.05	3.66	3.50	1.41	2.95	1.54	3.31	0.55	2.45	2.66	2.46	2.59	2.81	1.65	1.35	0.92	0.47
Silicon	0.7	14.25	17.06	16.32	6.56	13.79	7.18	15.43	2.55	11.45	12.43	11.49	12.11	13.11	7.72	6.32	4.30	2.21
Sulphur	0.04	0.81	0.97	0.93	0.37	0.79	0.41	0.88	0.15	0.65	0.71	0.66	0.69	0.75	0.44	0.36	0.25	0.13
Others	0.15	3.05	3.66	3.50	1.41	2.95	1.54	3.31	0.55	2.45	2.66	2.46	2.59	2.81	1.65	1.35	0.92	0.47
Aluminium	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09
Niobium	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09
Molybdenum	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09
Vanadium	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09
Titanium	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09
Calcium	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09
Cerium	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09
Tin	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09
Nitrogen	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09
Boron	0.03	0.61	0.73	0.70	0.28	0.59	0.31	0.66	0.11	0.49	0.53	0.49	0.52	0.56	0.33	0.27	0.18	0.09

1. Proposed end state as per Section 3.6
2. It is noted that a result of adopting the highest potential concentration per element from reference sources, the adopted weight percent values exceed 100% when summed.
3. MT – metric tonne

Appendix A4 Adopted steel composition and estimated maximum remaining mass below seabed by Steel Piled Jacket

Platform		HLA	FTA	CBA	MKA	KFA	KFB	WKF	FLA	BMA	WTA
Maximum mass of steel remaining below seabed based on proposed end states (MT)		**1788**	**876**	**1054**	**847**	**2199**	**2199**	**884**	**1030**	**857**	**335**
Constituent	**Wt %[1]**	**Maximum mass of steel constituent remaining below seabed under proposed end states (MT)**									
Carbon	0.25	4.47	2.19	2.64	2.12	5.50	5.50	2.21	2.58	2.14	0.84
Chromium	1	17.88	8.76	10.54	8.47	21.99	21.99	8.84	10.30	8.57	3.35
Copper	0.45	8.05	3.94	4.74	3.81	9.90	9.90	3.98	4.64	3.86	1.51
Iron	98	1752.24	858.48	1032.92	830.06	2155.02	2155.02	866.32	1009.40	839.86	328.30
Manganese	1.5	26.82	13.14	15.81	12.71	32.99	32.99	13.26	15.45	12.86	503
Nickel	0.5	8.94	4.38	5.27	4.24	11.00	11.00	4.42	5.15	4.29	1.68
Phosphorous	0.15	2.68	1.31	1.58	1.27	3.30	3.30	1.33	1.55	1.29	0.50
Silicon	0.7	12.52	6.13	7.38	5.93	15.39	15.39	6.19	7.21	6.00	2.35
Sulphur	0.04	0.72	0.35	0.42	0.34	0.88	0.88	0.35	0.41	0.34	0.13
Others	0.15	2.68	1.31	1.58	1.27	3.30	3.30	1.33	1.55	1.29	0.50
Aluminium	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10
Niobium	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10
Molybdenum	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10
Vanadium	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10
Titanium	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10
Calcium	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10
Cerium	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10
Tin	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10
Nitrogen	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10
Boron	0.03	0.54	0.26	0.32	0.25	0.66	0.66	0.27	0.31	0.26	0.10

1. It is noted that a result of adopting the highest potential concentration per element from reference sources, the adopted weight percent values exceed 100% when summed.
2. MT – metric tonne

Appendix A5 Adopted anode composition and estimated maximum remaining mass by Steel Piled Jacket and placed sections

SPJ		FTA		CBA		MKA		WKF		FLA		BMA	WTA
Maximum relative portion of SPJ based on proposed end states (MT)[1]		Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Placed sections	Retained above seabed	Retained above seabed
Maximum mass of anodes (MT)[3]		1.2	2.3	3.0	1.5	6.4	1.1	2.8	1.6	3.8	1.5	0.9	22.3
Constituent wt%[2]		Mass remaining in place (MT)											
Aluminium	97.825	1.1668	2.2642	2.8873	1.5059	6.2344	1.0322	2.6952	1.5865	3.6988	1.4846	0.8479	21.8225
Cadmium	0.012	0.0001	0.0003	0.0004	0.0002	0.0008	0.0001	0.0003	0.0002	0.0005	0.0002	0.0001	0.0027
Copper	0.01	0.0001	0.0002	0.0003	0.0002	0.0006	0.0001	0.0003	0.0002	0.0004	0.0002	0.0001	0.0022
Iron	0.15	0.0018	0.0035	0.0044	0.0023	0.0096	0.0016	0.0041	0.0024	0.0057	0.0023	0.0013	0.0335
Indium	0.05	0.0006	0.0012	0.0015	0.0008	0.0032	0.0005	0.0014	0.0008	0.0019	0.0008	0.0004	0.0112
Magnesium	2.2	0.0262	0.0509	0.0649	0.0339	0.1402	0.0232	0.0606	0.0357	0.0832	0.0334	0.0191	0.4908
Silicon	0.2	0.0024	0.0046	0.0059	0.0031	0.0127	0.0021	0.0055	0.0032	0.0076	0.0030	0.0017	0.0446
Titanium	0.05	0.0006	0.0012	0.0015	0.0008	0.0032	0.0005	0.0014	0.0008	0.0019	0.0008	0.0004	0.0112
Zinc	5	0.0596	0.1157	0.1476	0.0770	0.3186	0.0528	0.1378	0.0811	0.1891	0.0759	0.0433	1.1154
Others	0.05	0.0006	0.0012	0.0015	0.0008	0.0032	0.0005	0.0014	0.0008	0.0019	0.0008	0.0004	0.0112

1. Proposed end state as per selections in Section 3.6
2. It is noted that a result of adopting the highest potential concentration per element from reference sources, the adopted weight percent values exceed 100% when summed.
3. MT = metric tonnes.

Appendix A6 Dredging estimates for removal of Steel Piled Jackets to just below the seabed

Facility	Estimated Dredge volume [m3]
HLA	20,000
KFA	10,000
KFB	10,000
MKA	8,000
WKF	8,000
CBA	8,000
FLA	8,000
FTA	8,000
BMA	6,000
WTA	2,000

Estimates for HLA, KFA and KFB include for dredging of the strut footing piles.

Appendix A7 Assumed adjacent placement seabed coverage

Facility	Seabed area of coverage (m2)
HLA	12,300
KFA	7,400
KFB	7,400
MKA	2,500
WKF	4,500
CBA	4,600
FLA	2,600
FTA	Not selected - insufficient water depth.
BMA	Not selected - insufficient water depth.
WTA	Not selected - insufficient water depth.

Estimates are based on assumed vessel capabilities, cut patterns and vertical placement of nominated sections

Appendix B Essos Environmental Policy

INTRODUCTION

The high quality of the directors, officers, and employees of Exxon Mobil Corporation is the Corporation's greatest strength. The resourcefulness, professionalism, and dedication of those directors, officers, and employees make the Corporation competitive in the short term and well positioned for ongoing success in the long term.

The Corporation's directors, officers, and employees are responsible for developing, approving, and implementing plans and actions designed to achieve corporate objectives. The methods we employ to attain results are as important as the results themselves. The Corporation's directors, officers, and employees are expected to observe the highest standards of integrity in the conduct of the Corporation's business.

The Board of Directors of the Corporation has adopted and oversees the administration of the Corporation's *Standards of Business Conduct*. The policies in the *Standards of Business Conduct* are the foundation policies of the Corporation. Wholly-owned and majority-owned subsidiaries of Exxon Mobil Corporation generally adopt policies similar to the Corporation's foundation policies. Thus, the Corporation's foundation policies collectively express the Corporation's expectations and define the basis for the worldwide conduct of the businesses of the Corporation and its majority-owned subsidiaries.

The directors, officers, and employees of Exxon Mobil Corporation are expected to review these foundation policies periodically and apply them to all of their work. The Corporation publishes from time to time guidelines with respect to selected policies. Those guidelines are interpretive and administrative and are not part of the *Standards of Business Conduct*. Any employee who has questions concerning any aspect of these policies should not hesitate to seek answers from management or the other sources indicated in the section below called "Procedures and Open Door Communication."

No one in the ExxonMobil organization has the authority to make exceptions or grant waivers with respect to the foundation policies. Regardless of how much difficulty we encounter or pressure we face in performing our jobs, no situation can justify the willful violation of these policies. Our reputation as a corporate citizen depends on our understanding of and compliance with these policies.

Darren W. Woods
Chairman
January 2017

ENVIRONMENT POLICY

It is Exxon Mobil Corporation's policy to conduct its business in a manner that is compatible with the balanced environmental and economic needs of the communities in which it operates. The Corporation is committed to continuous efforts to improve environmental performance throughout its operations.

Accordingly, the Corporation's policy is to:

- comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist;
- encourage concern and respect for the environment, emphasize every employee's responsibility in environmental performance, and foster appropriate operating practices and training;
- work with government and industry groups to foster timely development of effective environmental laws and regulations based on sound science and considering risks, costs, and benefits, including effects on energy and product supply;
- manage its business with the goal of preventing incidents and of controlling emissions and wastes to below harmful levels; design, operate, and maintain facilities to this end;
- respond quickly and effectively to incidents resulting from its operations, in cooperation with industry organizations and authorized government agencies;
- conduct and support research to improve understanding of the impact of its business on the environment, to improve methods of environmental protection, and to enhance its capability to make operations and products compatible with the environment;
- communicate with the public on environmental matters and share its experience with others to facilitate improvements in industry performance;
- undertake appropriate reviews and evaluations of its operations to measure progress and to foster compliance with this policy.

Appendix C1 Consultation records

Consultation report (Summary)

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
3D Oil	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Australian Council of Trade Unions (ACTU)	D	1	EAPL sent a letter via email and offered to meet with Relevant Person in response to their submission to NOPSEMA during public consultation on the SPJ Environment Plan. Provided a contact for further discussion if needed.	Queries addressed.
Australian Fisheries Management Authority	A	6	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2 (Relevant Person acknowledged receipt).	No objections, claims or issues raised.
Australian Hydrographic Office	A	8	EAPL contacted Relevant Person to discuss decommissioning and EAPL offshore activities. EAPL provided Relevant Person with:	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• 2021 Annual Decommissioning Report (Relevant Person acknowledged receipt) • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2 (Relevant Person acknowledged receipt).	
Australian Institute of Marine and Power Engineers	D	1	RP made submission to NOPSEMA during public consultation period. EAPL responded directly to Relevant Person offering to meet. Provided a contact for further discussion if needed.	Queries addressed.
Australian Manufacturing Workers Union (AMWU)	D	6	RP made submission to NOPSEMA during public consultation period and expressed interest in onshore reception facility, pipelines and how much work is available overall. EAPL responded directly to Relevant Person. Meetings held to discuss decommissioning and other EAPL offshore activities. Agreed to continue regular consultation via quarterly meetings.	Queries addressed.
Australian Marine Oil Spill Centre (AMOSC)	A	6	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report (Relevant Person acknowledged receipt) • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2 offered to meet if Relevant Person would like to discuss (Relevant Person acknowledged receipt).	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
Australian Maritime Safety Authority (AMSA)	A	28	Multiple engagements via various methods including email, meetings and information materials including Annual Decommissioning Reports and Information Bulletins AMSA stated during various consultations - that a 55m clear water column would be adequate from a safety of navigation perspective, consistent with IMO Standard 3.6 (IMO Res. A.672(16), 1989) - that they must give consideration to other users of the sea, including potential future renewable energy projects	Queries addressed.
Australian Oceanographic Services	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Australian Southern Bluefin Tuna Industry Association	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Australian Wildcatch Fishing	D	9	Multiple engagements via various methods, including meeting in person. EAPL provided Relevant Person with:	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2. Relevant Person advised they would like to be represented by/consulted via SETFIA.	
Australian Wildlife Conservancy	D	1	EAPL contacted Relevant Person with offer to meet and discuss: 1. The decommissioning of SPJ 2. The Plug and Abandonment (P&A) work of the Gudgeon-1 and Terakihi-1 exploration well.	No objections, claims or issues raised.
Australian Workers' Union (AWU)	D	4	RP made submission to NOPSEMA during public consultation period and expressed interest in onshore reception facility, pipelines and how much work is available overall. EAPL responded directly to Relevant Person. Meetings held to discuss decommissioning and other EAPL offshore activities. Agreed to continue regular consultation via quarterly meetings.	Queries addressed.
Bass Oil	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Bass Strait Bait & Tackle Lakes Entrance	D	7	Met and spoke with Relevant Person on several occasions and discussed decommissioning and EAPL offshore activities. EAPL provided Relevant Person with:	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
Beach Energy	D	5	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Boating Industry Association of Victoria	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Bunurong Land Council Aboriginal Corporation	D	3	EAPL attempted contact via phone and provided Relevant Person with the following via email: • 2022 Annual Decommissioning Report	No objections, claims or issues raised.
Bush Heritage	D	1	EAPL contacted Relevant Person with offer to meet and discuss: 1. The decommissioning of SPJ 2. The Plug and Abandonment (P&A) work of the Gudgeon-1 and Terakihi-1 exploration well.	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
CarbonNet	B	7	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • Decommissioning Information Bulletin #1 - Relevant Person called EAPL to confirm they would like to receive future bulletin's. Agreed to continue regular consultation • Decommissioning Information Bulletin #2. Relevant Person outlined specific queries to discuss regarding the decommissioning of Perch. EAPL responded to Relevant Persons queries.	Queries addressed.
Centre of Decommissioning Australia	A	2	Shared Esso decommissioning plans with Relevant Person and offered to discuss if any questions. Relevant Person advised they had read the material and would be happy to support where needed. Ongoing engagement as part of usual course of business activities.	No objections; supportive of Esso approach
Committee for Gippsland	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections; supportive of Esso approach
Commonwealth Fisheries Association	D	6	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1	Queries addressed.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• Decommissioning Information Bulletin #2. Relevant Person contacted EAPL and CFA regarding concerns over the volume of consultation required in the Bass Strait. A resolution was reached over the format of consultation. Esso continues to engage with commercial fisherman to understand and address concerns.	
Community Over Mining	D	4	EAPL provided Relevant Person with: • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2 • 2022 Annual Decommissioning Report. Relevant Person attended drop-in session and discussed Gudgeon and Terakihi PA, decommissioning and pipelines. RP tended to raise other issues not directly related to the activities in this EP.	No objections, claims or issues raised relevant to this EP.
Cooper Energy	D	9	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Corner Inlet Fisheries Habitat Association	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
Country Fire Authority (Region 10)	D	4	EAPL contacted and offered to meet with Relevant Person to discuss decommissioning and EAPL offshore activities. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Danish Seine Vessel	D	1	EAPL met with Relevant Person to further discuss the 2021 Annual Decommissioning Report and other items. Relevant person indicated support for the less disturbance to the environment the better (e.g. dredging) and if SPJ is left it needs to be seen and a reduction in PSZ might be of value. Relevant Person preferred engagement coordinated via SETFIA.	Queries addressed.
Department of Climate Change, Energy, the Environment and Water (DCCEEW)	A	8	Multiple engagements have been held to discuss: the applicability of the Sea Dumping and Environment Protection Biodiversity (EPBC) Acts to the proposed end states, the content and format of Sea Dumping Permits, updates on decommissioning planning and Options Assessments for the SPJs, jurisdictional boundaries between offshore regulators with regards to the SPJ end states and resolving specific queries during preparation of Sea Dumping Permits. Consultation on-going in relation to Sea Dumping Permit applications.	No objections, claims or issues raised.
DCCEEW as Department of Agriculture, Water and the Environment	A	16	EAPL contacted and offered to meet with Relevant Person to discuss decommissioning and EAPL offshore activities and specifically Sea Dumping Act requirements.	Queries addressed.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2 (Relevant Person acknowledged receipt) • Various meeting materials during course of discussions. Relevant Person providing initial feedback on EM question about jurisdictions and in particular the coverage of the EPBC Act. DAWE is now DCCEEW.	
Department of Energy, Environment and Climate Action (DEECA)	B/C	3	Multiple engagements with Relevant Persons for SEA CCS Pipeline and Offshore Decommissioning – Campaign 1 and Pipelines.	No objections, claims or issues raised.
DEECA as Department of Environment, Land, Water and Planning	B/C	7	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2 (Relevant Person acknowledged receipt).	No objections, claims or issues raised.
DEECA as Department of Jobs Precincts and Regions	B/C	7	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	Queries addressed.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			Relevant Person outlined specific queries to discuss regarding the decommissioning of Perch. EAPL responded to Relevant Persons queries. Ongoing discussions relating to all decommissioning activities.	
Department of Industry, Science, Energy and Resources	A	6	Provided Relevant Persons with decommissioning information.	No objections, claims or issues raised.
Department of Transport and Planning (DTP)	B	2	EAPL met with Relevant Person and discussed EAPL offshore activities including G&T P&A, SEA CCS and decommissioning.	No objections, claims or issues raised.
DTP as Department of Transport	B	6	Multiple engagements via various methods to discuss EAPL operations and ongoing activities as they relate to oil spill preparedness & response arrangements. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Director of National Parks	A	6	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2 (Relevant Person acknowledged receipt).	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			Relevant Person advised EAPL that the planned activities do not overlap any Australian Marine Parks, therefore no authorisation requirements from DNP. Relevant Person requested a presentation on decommissioning which EAPL agreed to.	
East Gippsland Catchment Management Authority	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
East Gippsland Estuarine Fishermen's Association	D	6	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
East Gippsland Shire Council	D	8	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2 (Relevant Person acknowledged receipt).	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			EAPL advised Relevant Person of public consultation process on proposed SPJ Environmental Plan in conjunction with NOPSEMA and included links to the EP.	
Eastern Victorian Sea Urchin Divers Association	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Eastern Zone Abalone Industry Association	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Electrical Trades Union (ETU)	D	5	RP made submission to NOPSEMA during public consultation period andexpressed interest in onshore reception facility, pipelines and how much work is available overall. EAPL responded directly to Relevant Person. Meetings held to discuss decommissioning and other EAPL offshore activities. Agreed to continue regular consultation via quarterly meetings.	Queries addressed.
Emperor Energy	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
Environment Protection Authority (Tasmania)	B	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Environment Protection Authority Victoria	B	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Extinction Rebellion Australia	D	1	EAPL contacted Relevant Person with offer to meet and discuss: 1. The decommissioning of SPJ 2. The Plug and Abandonment (P&A) work of the Gudgeon-1 and Terakihi-1 exploration well.	No objections, claims or issues raised.
Far Out Charters	D	5	EAPL phoned Relevant Person to provide an update on decommissioning / non-producing assets. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
Fishing Tribunal	D	13	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2. EAPL responded to Relevant Persons queries.	Queries addressed.
Fishing Tribunal (Independent chair)	D	20	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2. EAPL advised Relevant Persons of commenced public consultation process on proposed SPJ Environmental Plan in conjunction with NOPSEMA and included links to the EP.	Queries addressed.
Fishing Tribunal (Member)	D	9	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	Queries addressed.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			EAPL advised Relevant Persons of commenced public consultation process on proposed SPJ Environmental Plan in conjunction with NOPSEMA and included links to the EP.	
Friends of the Earth	D	4	Relevant Person requested engagement with EAPL to improve their understanding of the industry. EAPL provided a response via email and held an in-person discussion relating to offshore operations and decommissioning activities. Relevant Person advised they would like to continue to be consulted in the future.	Queries addressed.
Game Fishing Association of Victoria	D	27	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	Queries addressed.
Gippsland Lakes Fishing Club	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Gippsland Ports	B	5	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
GreenPeace	D	1	EAPL contacted Relevant Person with offer to meet and discuss: 1. The decommissioning of SPJ 2. The Plug and Abandonment (P&A) work of the Gudgeon-1 and Terakihi-1 exploration well.	No objections, claims or issues raised.
Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC)	D	23	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Hewardia	D	2	Relevant Person advised they would like to be represented by / consulted via SETFIA.	No objections, claims or issues raised.
Koorie Heritage Trust	D	5	EAPL met with Relevant Person to discuss Esso Australia's operations and ongoing activities. EAPL requested and recieved guidance on consultation approach with relevant Indigenous groups, and discussions on sea country and cultural heritage.	No objections, claims or issues raised.
Lake Tyers Beach Angling Club	D	12	Met and spoke with Relevant Person on several occasions and discussed decommissioning and EAPL offshore activities. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report	Queries addressed.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
Lakes Entrance Fisherman's Club	D	35	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2. EAPL advised Relevant Person of commenced public consultation process on proposed SPJ Environmental Plan in conjunction with NOPSEMA and included links to the EP.	Queries addressed.
Lakes Entrance Fishermen's Co-Operative	D	18	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2. EAPL advised Relevant Person of commenced public consultation process on proposed SPJ Environmental Plan in conjunction with NOPSEMA and included links to the EP.	Queries addressed.
Lakes Entrance Scallop Fishing Industry Association	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
Lakes Entrance Visitor Information Centre	D	9	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2. EAPL advised Relevant Person of commenced public consultation process on proposed SPJ Environmental Plan in conjunction with NOPSEMA and included links to the EP.	No objections, claims or issues raised.
Life Saving Victoria	D	5	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Lonsdale Eco Cruise	D	1	EAPL met with Relevant Person to discuss decommissioning. Relevant Person advised they would no longer like to be consulted.	No objections, claims or issues raised.
Marine and Safety Tasmania	D	3	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
Maritime Industry Australia Limited	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Maritime Union of Australia (MUA)	D	2	RP made submission to NOPSEMA during public consultation period. EAPL responded directly to Relevant Person offering to meet. Provided a contact for further discussion if needed.	Queries addressed.
Marley Point	D	1	Met with Relevant Person to discuss EAPL offshore activities including decommissioning.	No objections, claims or issues raised.
Mitchelson Fisheries Pty Ltd	D	6	EAPL spoke with Relevant Person who nominated not to meet in person. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Mornington Peninsula Shire	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
National Decommissioning Research Initiative	D	2	EAPL provided Relevant Person with: • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
National Offshore Petroleum Titles Administrator (NOPTA)	A	5	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Oil Spill Response Limited	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Panama II Octopus fishing vessel	D	11	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report	Queries addressed.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
Parks Australia	A	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Parks Victoria	B	5	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Piscari Industries Pty Ltd	D	6	Met with Relevant Person and discussed decommissioning and EAPL offshore activities. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Port of Hastings	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
Relevant Person #192	D	6	Met with relevant Person and discussed decommissioning and EAPL offshore activities. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Relevant Person #201	D	3	Met with Relevant Person to discuss 2021 Annual Decommissioning Report. EAPL provided Relevant Person with: • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Relevant Person #351	D	1	RP sought to have structures retained. EAPL engaged directly with Relevant Person in response to their submission to NOPSEMA during public consultation on the SPJ Environment Plan. Provided a contact for further discussion if needed.	Queries addressed.
Relevant Person #352	D	1	RP sought to have structures retained.	Queries addressed.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			EAPL engaged directly with Relevant Person in response to their submission to NOPSEMA during public consultation on the SPJ Environment Plan. Provided a contact for further discussion if needed.	
Relevant Person #358	D	3	Relevant Person sent email with query regarding decommissioned pipelines. EAPL provided an email response.	Queries addressed.
Relevant Person #360	D	2	Relevant Person attended drop-in session seeking information on decommissioning activities. EAPL provided information.	Queries addressed.
Relevant Person #367	D	1	Relevant Person attended drop-in session seeking information on decommissioning activities. EAPL provided information.	Queries addressed.
Relevant Person #369	D	1	Relevant Person attended drop-in session seeking information on decommissioning activities. EAPL provided information.	Queries addressed.
Relevant Person #375	D	1	Relevant Person attended drop-in session seeking information on decommissioning activities. EAPL provided information.	Queries addressed.
Relevant Person #376	D	1	Relevant Person attended drop-in session seeking information on decommissioning activities. EAPL provided information.	Queries addressed.
Relevant Person #377	D	1	Relevant Person attended drop-in session seeking information on decommissioning activities. EAPL provided information.	Queries addressed.
Relevant Person #384	D	4	Email received from Relevant Person identifying potential Relevant Person in local area, which was then contacted.	Queries addressed.
Relevant Person #385	D	5	EAPL met with Relevant Person to discuss offshore activities including decommissioning.	Queries addressed
Save Westernport	D	2	RP attended drop-in session.	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			Email received from Relevant Person re artificial reef project (Bali).	
Scallop Fishermen's Association Inc.	D	9	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	Queries addressed.
Seafood Industry Victoria	D	15	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2. EAPL advised Relevant Persons of commenced public consultation process on proposed SPJ Environmental Plan in conjunction with NOPSEMA and included links to the EP.	Queries addressed.
SETFIA	D	141	Long standing Relevant Person relationship. Multiple engagements via various methods including email, phone calls, online meetings, in person meetings. EAPL provided Relevant Person with various materials including: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report	Queries addressed.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2 • Meeting materials • Shared video coverage from ROV surveys. Concerns include fishing ground coverage and compensation programs.	
SETFIA Chairman	D	6	Multiple engagements via various methods. EAPL provided Relevant Person with: • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2 • 2022 Annual Decommissioning Report. Reviewed correspondence received and talked broadly through key questions. Also reviewed Esso facilities map and descriptions.	Queries addressed.
Seven Group Holdings Limited (formerly Nexus)	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Silver Star (Atoll)	D	3	Met with relevant Person and discussed decommissioning and EAPL offshore activities. EAPL provided Relevant Person with: • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
South Gippsland Shire Council	D	5	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Southern Shark Industry Alliance	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Star of the South	D	10	Multiple engagements via various methods. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Sustainable Shark Fishing Association	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
Tasmanian Aboriginal Centre	D	1	EAPL contacted Relevant Person to discuss offshore activities including decommissioning. Relevant Person advised not interested in EAPL activities.	No objections, claims or issues raised.
Tasmania Parks and Wildlife Service	B	3	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Tasmanian Land Conservancy	D	1	EAPL contacted Relevant Person with offer to meet and discuss: 1. The decommissioning of SPJs 2. The Plug and Abandonment (P&A) work of the Gudgeon-1 and Terakihi-1 exploration well.	No objections, claims or issues raised.
Tasmanian Seafood Industry Council	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
The Nature Conservancy	D	1	EAPL contacted Relevant Person with offer to meet and discuss: 1. The decommissioning of SPJs 2. The Plug and Abandonment (P&A) work of the Gudgeon-1 and Terakihi-1 exploration well.	No objections, claims or issues raised.
The Wilderness Society	D	5	EAPL sent a letter via email and offered to meet with Relevant Person in response to their submission to NOPSEMA during public	

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			consultation on the SPJ Environment Plan. Followed up with letter sent via post. Provided a contact for further discussion if needed.	
Transport for New South Wales	B	6	Meeting with Relevant Person to discuss Esso Australia's operations and ongoing activities as they relate to oil spill preparedness & response arrangements. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Transport Safety Victoria – Maritime Safety	B	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Trust For Nature	D	1	EAPL contacted Relevant Person with offer to meet and discuss: 1. The decommissioning of SPJs 2. The Plug and Abandonment (P&A) work of the Gudgeon-1 and Terakihi-1 exploration well.	No objections, claims or issues raised.
Victoria Game Fishing Club	D	5	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report	No objections, claims or issues raised.

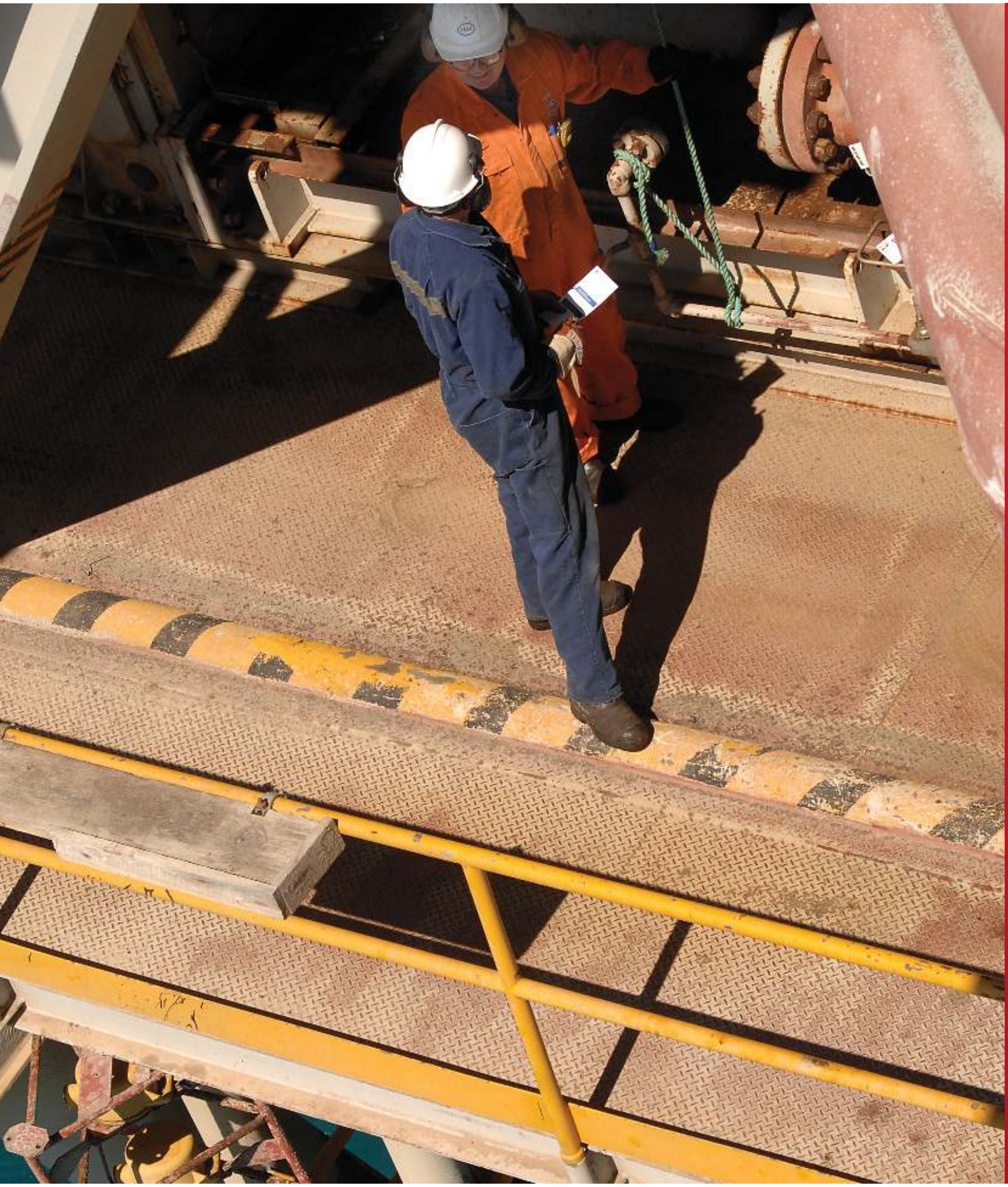
Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			• Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	
Victorian Fisheries Authority	B	6	EAPL attended Relevant Person's office in Lakes Entrance to discuss decommissioning. Relevant Person was unavailable, EAPL left contact details with reception. EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Victorian Recreational Fishing	D	5	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 (Relevant Person acknowledged receipt) • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Victorian Regional Channels Authority	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
Victorian Rock Lobster Association	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Victorian Scallop Fisherman's Association Inc.	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Victorian Trades Hall Council (VTHC)	D	1	RP made submission to NOPSEMA during public consultation period. EAPL responded directly to Relevant Person offering to meet. Provided a contact for further discussion if needed.	Queries addressed.
Wellington Shire Council	D	5	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Western Australian Fishing Industry Council	D	1	RP made submission to NOPSEMA during public consultation period. EAPL responded directly to Relevant Person offering to meet.	Queries addressed.

Relevant person	Category	Number of consultations	Consultation summary	Consultation status
			Provided a contact for further discussion if needed.	
Wildlife Victoria	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.
Worksafe Victoria	B	1	EAPL phoned Relevant Person to discuss decommissioning work in general. An offer to provide the Offshore Decomm Annual Report was declined.	No objections, claims or issues raised.
World Wide Fund for Nature	D	1	EAPL contacted Relevant Person with offer to meet and discuss: 1. The decommissioning of SPJ 2. The Plug and Abandonment (P&A) work of the Gudgeon-1 and Terakihi-1 exploration well.	No objections, claims or issues raised.
Yachting Victoria	D	4	EAPL provided Relevant Person with: • 2021 Annual Decommissioning Report • 2022 Annual Decommissioning Report • Decommissioning Information Bulletin #1 • Decommissioning Information Bulletin #2.	No objections, claims or issues raised.

Appendix C2 Information bulletins


ExxonMobil



→ Regular inspection, maintenance and repairs continue to be conducted at the Fortescue platform

→ OUR COMMITMENT

As the operator of some of Australia's most mature oil and gas fields, Esso is committed to decommissioning our Bass Strait offshore facilities safely and effectively.

While we plan for decommissioning, we continue to focus on safely shutting-down facilities as they reach the end of their productive life, and ensuring they stay safe throughout the entire decommissioning process.

Bass Strait Operations Overview

Esso Australia Resources Pty Ltd (Esso) is a wholly owned subsidiary of ExxonMobil Australia Pty Ltd. Esso operates assets in Bass Strait, off Victoria's Gippsland coast, in partnership with the Gippsland Basin Joint Venture (Esso and BHP Petroleum (Bass Strait) Pty Ltd (BHP)) and the Kipper Unit Joint Venture (Esso, BHP, and MEPAU A Pty Ltd). Esso receives services, including personnel, from Esso Australia Pty Ltd, which is also a wholly owned subsidiary of ExxonMobil Australia Pty Ltd.

The offshore facilities extract, process and store oil and gas, which is transported onshore for further processing and distribution to customers. A variety of products are produced from operations in Bass Strait, ranging from gas and condensate to oil. Different reservoirs produce hydrocarbon products with different properties. Pipelines contain a combination of reservoir fluids.

Operations history

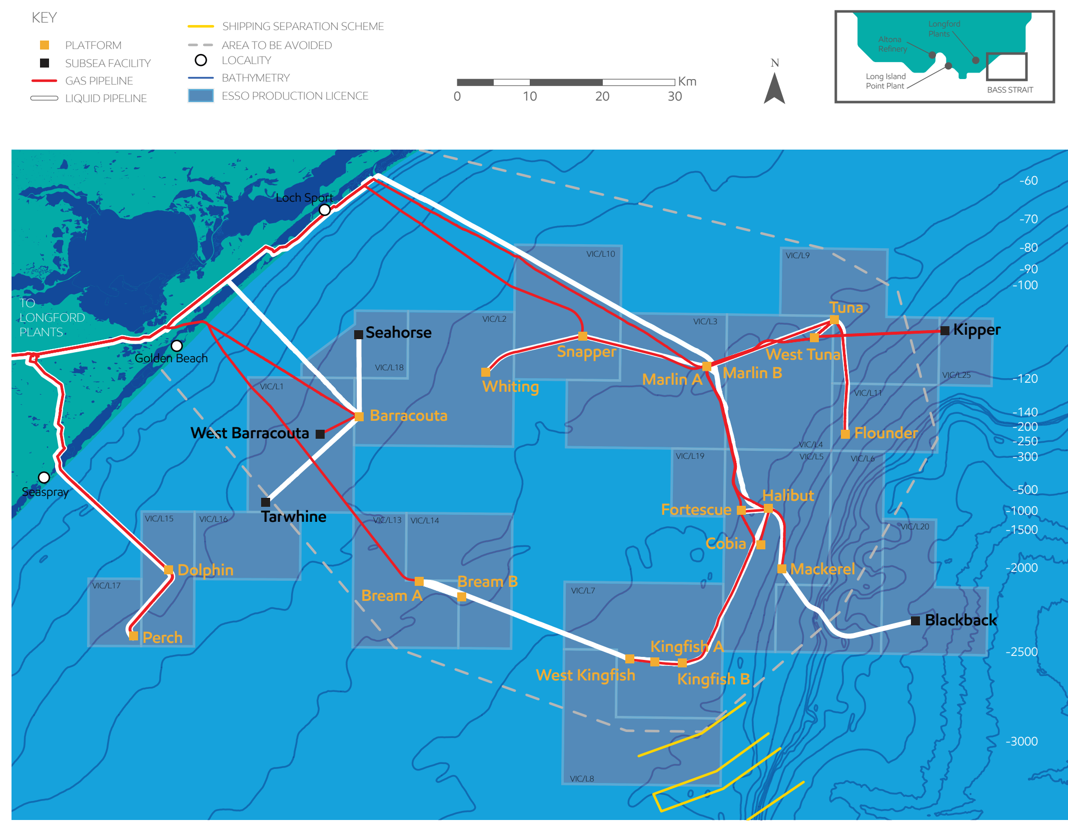
In 1965, the Gippsland Basin Joint Venture drilled Australia's first offshore well in Bass Strait, resulting in the discovery of the Barracouta gas field. Two years later, the first offshore oil field, Kingfish, was discovered. To this day, this remains the largest oil field ever discovered in Australia. Production from the first platform commenced in 1969.

Through the continued exploration, development and production of oil and gas in Bass Strait, there are now 421 wells, 19 platforms, five subsea facilities and more than 800 kilometres of subsea pipelines.

Esso's activities in Bass Strait are conducted by some 300 workers who live and work offshore at any one time. They are supported by many more onshore workers, who process the oil and gas at Esso's Longford and Long Island Point plants before supplying gas to Australian customers, and liquids products to Australian and overseas customers.

Platform operations are supported by helicopters and supply vessels. A heliport based in Longford operates regular flights to transfer personnel to and from platforms. The supply vessels operate out of Barry Beach Marine Terminal, moving between platforms to load and unload cargo.

The Gippsland Basin Joint Venture has been responsible for more than 50% of Australia's crude oil and liquid production, and currently supplies more than 40% of eastern Australia's natural gas requirements. This equates to more than four billion barrels of crude oil and around eight trillion cubic feet of gas produced since production began over 50 years ago.



Location

Esso's operations are located in Bass Strait, off Victoria's Gippsland coast in Australia. The Operational Area lies entirely within the South-west Marine Region.

The facilities are located in water depths ranging from 38 metres (Dolphin platform) to 402 metres (Blackback subsea facility). Their distance from the coast ranges from 12 kilometres (Seahorse subsea facility) to 87 kilometres (Blackback subsea facility).

Status

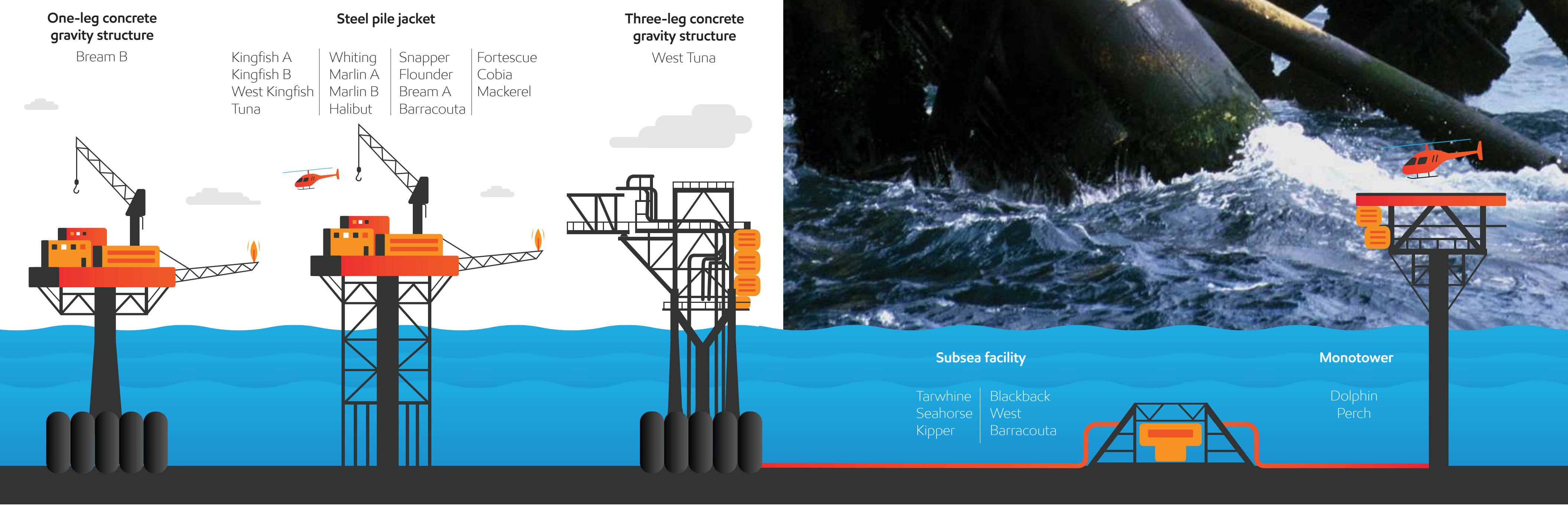
Ten platforms, three subsea facilities, 16 pipelines and approximately half of all wells drilled are no longer producing oil and gas.

A further three platforms are expected to progressively stop producing oil and gas during the next few years.

In parallel with Esso's investigations into re-using some of the offshore facilities for other purposes, Esso's decommissioning team is planning for the eventual decommissioning of all assets in Bass Strait.

Esso operates 19 platforms, five subsea facilities, 34 primary licensed pipelines and eight secondary licensed pipelines.

Of the 19 platforms - 15 are steel pile jacket platforms, two are concrete gravity structures and two are monotowers. There is also one steel pile jacket riser access tower.



UP CLOSE:

Planning decommissioning activities in Bass Strait

The process of decommissioning an offshore facility presents complex challenges. Decommissioning plans must consider the specific marine ecosystem, the size and weight of facilities, and the inherent risks of removing such facilities, among other factors.

Esso's approach to decommissioning considers the type of structure and unique characteristics of a specific site.

We incorporate best practices from other projects and expert advice from relevant stakeholders, including fishing communities, scientific organisations, repurposing and recycling specialists and academia.

Our Australian decommissioning team is using learnings from our experiences in other locations, and liaising closely with our decommissioning centre of expertise, to ensure our local decommissioning activities meet regulatory, community, government and importantly, our own, high expectations.

Planning and preparation for decommissioning offshore facilities can start up to 10 years prior to actual execution, which is why we're starting our detailed planning now.

ABOVE WATER REMOVAL

100%

OF TOPSIDES WILL BE REMOVED

Esso will remove the production facilities (or topsides) from the non-producing platforms for disposal onshore.

BELOW WATER REMOVAL

3 OPTIONS

THE DEPTH OF JACKETS TO BE REMOVED IS YET TO BE DETERMINED

Esso will either transport the removed jacket sections onshore for handling and appropriate recycling and disposal; or potentially reef them by placing the removed jacket sections on the seabed at a to-be-determined location, subject to regulatory approval and detailed analysis.

→ Kingfish A platform

→ ROV imagery collected by Esso showing delicate soft-bodied invertebrates attached to structures

→ PRESERVING MARINE HABITATS

The platform jackets that have been in place for several decades provides opportunities for marine ecosystems to develop which otherwise wouldn't exist. For example, a review of Remotely Operated Vehicle (ROV) imagery from three platforms identified 6820 individuals from 37 different species. Leaving some of these jackets in place, and the ecosystems that have developed around them, provides the opportunity for ongoing benefits for the marine environment and for stakeholders.

Esso is considering decommissioning options that deliver equal or better environmental, safety and well integrity outcomes than the base case option; and meet the As Low As Reasonably Practicable (ALARP) and acceptability Environment Plan acceptance criteria required by the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulation 2009*.

Assessing decommissioning options

Section 572 (3) of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*, requires Esso to remove all structures, equipment and other property that is neither used nor to be used, in connection with operations, from the title area. The obligation to fully remove all property is subject to other provisions of the Act, regulations, directions and other applicable laws. These provisions allow for a titleholder to propose variations to complete removal if the variations meet acceptance criteria.

As such, Esso has identified a range of decommissioning options that include the 'base case' required by the Act as well as consideration of other feasible options.

Esso is undertaking an evaluation of the decommissioning options to assess environmental impacts and risks that may arise, as well as technical, safety and socio-economic aspects.

This evaluation is based on global studies and literature, supplemented by further assessments using Bass Strait specific studies, including environmental sampling, undertaken by Esso. It will evaluate each option against applicable Commonwealth and State legislation, codes, standards, treaties, conventions and practices.

Esso is seeking stakeholder input and perspectives throughout the process.

→ Whiting platform in the Cessation of Production stage of activity with wells plugged and abandoned and well conductors removed

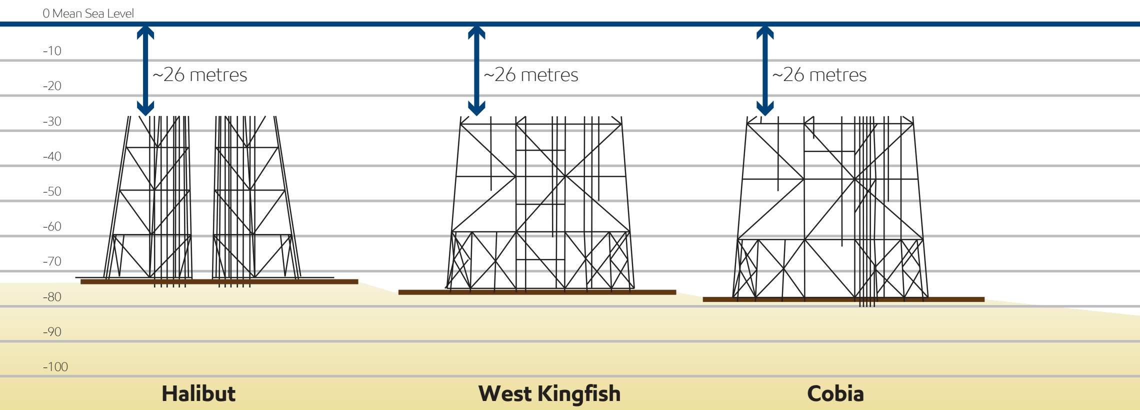
ABOUT THE OPTIONS

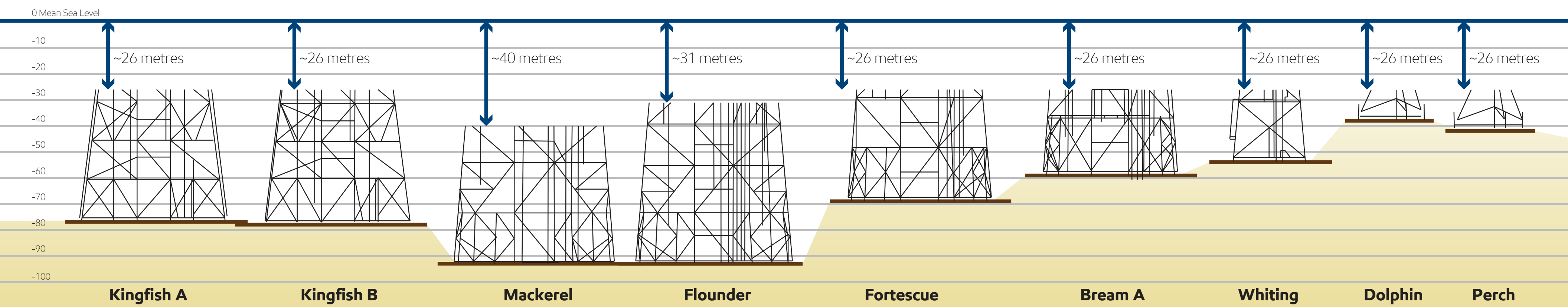
- Esso is currently considering three options for removing sections of the non-producing platform jackets to provide sufficient water depth clearance to allow vessels safe passage over the remaining structure.
- The three options involve cutting the jacket at:
  - ~26 metres below Mean Sea Level
  - ~55 metres below Mean Sea Level
  - As close as practicable to the sea bed, which is unlikely to be over-trawlable.
- These options are applicable to the seven non-producing steel pile jacket platforms (Kingfish A, Kingfish B, Mackerel, Flounder, Fortescue, Bream A and Whiting), both monotowers (Dolphin and Perch) and three platforms nearing end-of-production (Cobia, Halibut and West Kingfish).
- Decommissioning options for the producing steel pile jacket platforms, concrete gravity structures, pipelines and subsea facilities will be addressed at a later stage.

1 OPTION 1
26-metre minimum water column

In the case of Mackerel and Flounder, the cut of platform depth is increased to avoid cutting through larger jacket legs on these two platforms.

This option involves cutting the steel pile jackets at a minimum of 26 metres below Mean Sea Level. The top section of the jacket will be removed and the lower section of the jacket will be left in place.



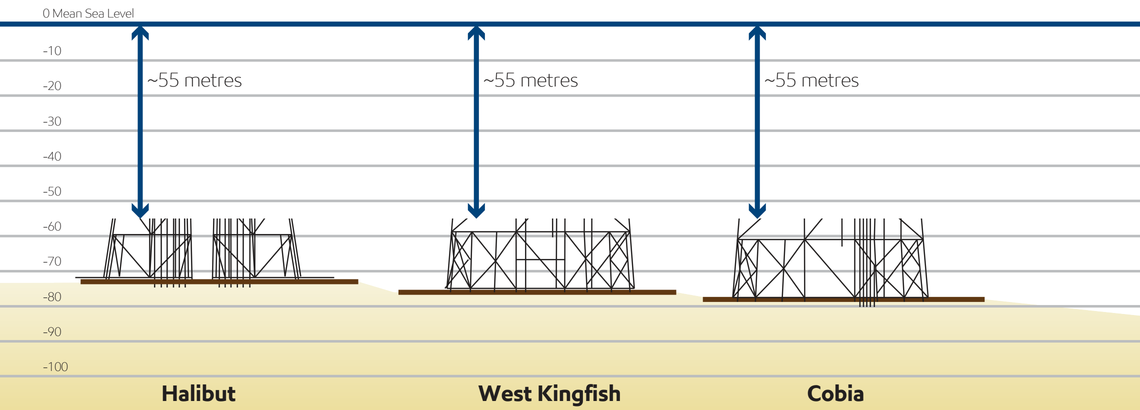


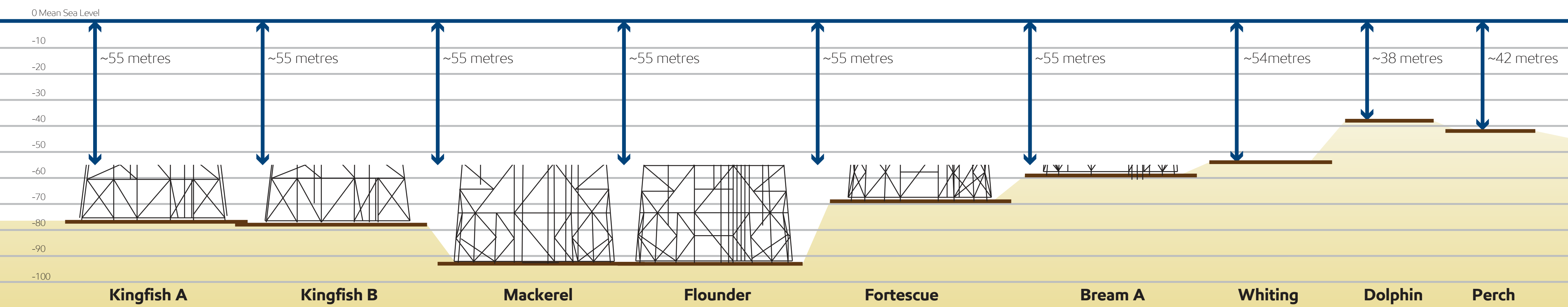
2 OPTION 2
55-metre minimum water column

Dolphin and Perch monotowers have a total depth of less than 55 metres and are gravity based (that is sitting on the seabed). As such they will be fully removed under this option.

Whiting which also has a total depth of less than 55 metres will be cut as close as practicable to just above the sea bed, which is unlikely to be over-trawlable.

This option involves cutting the steel pile jackets at a minimum of 55 metres below Mean Sea Level. The top section of the jacket will be removed and the lower section of the jacket will be left in place.





3 BASE CASE
Cut above mudline

This option involves cutting the steel pile jackets as close as practicable to the sea bed, which is unlikely to be over-trawlable. The top section of the jacket will be removed and the lower section of the jacket will be left in place. This option avoids extensive dredging which would be required to remove jacket legs beneath the seabed.

Dolphin and Perch platforms will be fully removed down to the seabed.

→ Bream A platform

CHOOSING AN OPTION

Environmental studies will inform decision-making

Esso will seek expert advice

Esso is evaluating recycling and disposal options

Esso Australia is committed to engaging with the communities where we operate and helping our stakeholders to understand our business.

Esso has been consulting with stakeholders potentially affected by this campaign through a number of different channels.

While some community consultations have occurred, Esso welcomes the opportunity for more face-to-face meetings and will continue to keep interested stakeholders informed of proposed activities throughout the planning phase and into the operational phase.

Through its stakeholder engagement framework, Esso aims to keep government, non-government organisations and community stakeholders informed about decommissioning activities. This includes ensuring that stakeholders are consulted on an ongoing basis about matters that affect them.

Key principles of Esso's stakeholder engagement framework include:

- providing meaningful information in a format and language that is readily understandable and tailored to the needs of stakeholders
- providing information that is timely and easily accessible to stakeholders
- establishing two-way dialogue and clear reporting mechanisms that allow stakeholders to have their issues heard and addressed
- inclusiveness in the representation of views, particularly for minority and special interest groups
- incorporating stakeholder feedback into Decommissioning Program design.

Throughout decommissioning, Esso will maintain ongoing consultation with relevant community, government and non-government stakeholders to share information, receive feedback and respond to any concerns.

Stakeholder consultation is conducted in a way that suits the needs of stakeholders and includes meetings, individual discussions, emails, fact sheets, forums and round tables, website updates, social media posts, and media announcements. All communication with stakeholders is documented, with any issues or grievances raised registered.

Actions are tracked to resolve issues or grievances, and feedback is provided to stakeholders as required.

A Stakeholder Engagement Plan has been developed for the decommissioning of Bass Strait facilities. The Stakeholder Engagement Plan aims to ensure relevant people as described in subregulation 11A (1) of the *Offshore Petroleum Greenhouse Gas Storage (Environment) Regulations 2009* are consulted about proposed decommissioning options.

Esso will address questions and consider feedback from stakeholders throughout this campaign.

If you have any specific questions or feedback about any of these activities please contact Esso at: consultation@exxonmobil.com or call 03 9261 0260.

→ Local commercial fishing vessel

For further information, please contact our stakeholder engagement team at:

consultation@exxonmobil.com

Alternatively, our Head Office for the ExxonMobil companies in Australia can be contacted by calling:

+61 3 9261 0000

or writing to:

GPO Box 400 Melbourne VIC 3001

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About Esso Australia

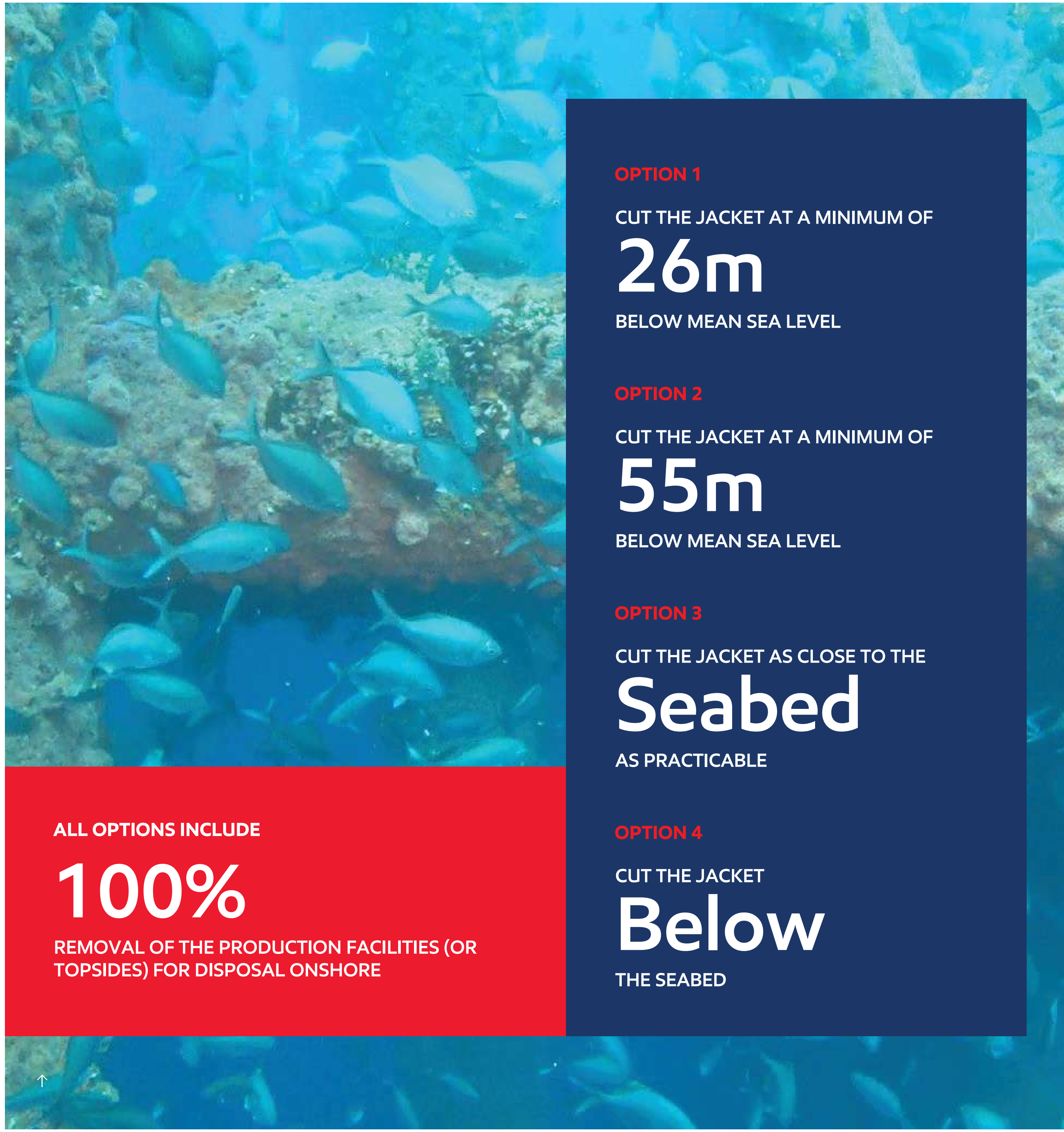
As operator of some of Australia's most mature oil and gas fields, Esso Australia is committed to decommissioning our Bass Strait offshore facilities safely and effectively. This includes working together with government, community and non-government organisation stakeholders to determine options for decommissioning non-producing infrastructure that balance environmental impacts and benefits with the needs of the community and requirements of regulatory authorities.

Assessing decommissioning options

In accordance with Section 572 (3) of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*, Esso Australia is required to remove all structures, equipment and other property no longer used for operations. This obligation is subject to other provisions of the Act, regulations, directions and other applicable laws, which allow variations to full removal if the variations meet acceptance criteria.

As such, Esso Australia evaluated a range of decommissioning options, including full removal required by the Act, for environmental impacts and risks that may arise, as well as technical, safety and socio-economic aspects. The evaluation was based on global studies and literature, supplemented by further assessments using Bass Strait specific studies, including environmental sampling, undertaken by Esso Australia with specialist partners. For example, Esso Australia partnered with expert researchers, academics and environmental consultants to complete a three-part comprehensive offshore environmental survey in 2021, which included: a detailed examination of fish and epibenthic communities by AIMS; a benthic infauna identification by AECOM; and a sediment analysis by CSIRO.

In addition to research and field studies, decommissioning options were also evaluated against applicable legislation, codes, standards, conventions and practices. The results of the extensive evaluation identified three feasible options. After further discussion and alignment with key stakeholders, a fourth feasible option was identified and assessed in detail.



ALL OPTIONS INCLUDE

100%

REMOVAL OF THE PRODUCTION FACILITIES (OR TOPSIDES) FOR DISPOSAL ONSHORE

OPTION 1

CUT THE JACKET AT A MINIMUM OF

26m

BELOW MEAN SEA LEVEL

OPTION 2

CUT THE JACKET AT A MINIMUM OF

55m

BELOW MEAN SEA LEVEL

OPTION 3

CUT THE JACKET AS CLOSE TO THE

Seabed

AS PRACTICABLE

OPTION 4

CUT THE JACKET

Below

THE SEABED

WHICH REGULATORS APPROVE THE DECOMMISSIONING?

Meeting regulatory obligations

Esso Australia assessed whether the feasible options provide equal or better environmental, safety and well integrity outcomes than full removal. For the options shown to achieve equal or better outcomes, they were further assessed to ensure that:

i. environmental risks and impacts would be reduced to As Low As Reasonably Practicable (ALARP); and

ii. be of an acceptable level as defined in the regulations.

These assessments are required by the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulation 2009*.

Where a decommissioning concept does not propose the full removal of property, Esso Australia will present proposed alternatives to NOPSEMA for assessment.

Esso Australia is also required to seek approval from DAWE for any infrastructure that is intended to remain on or below the seabed after decommissioning is complete.

If NOPSEMA and DAWE approvals are obtained for the alternative approaches, Esso Australia will develop Environment Plans for the decommissioning of each platform based on the approved approaches.

Decommissioning options for steel jacket platforms still operating, concrete gravity structures, pipelines and subsea facilities will be the subject of future assessment, stakeholder consultation and regulatory submissions.

Kingfish A platform →

Identifying the best way forward

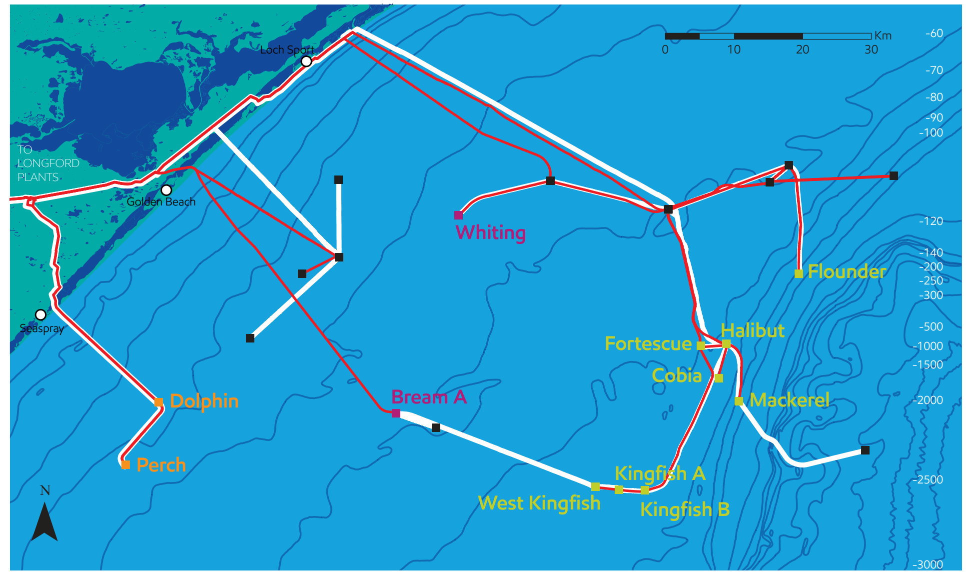
The detailed evaluation and assessment process highlighted the options which most effectively balance the retention of the extensive ecosystems that have developed on and around the platforms since their installation with the needs of communities, government and non-government stakeholders. These are:

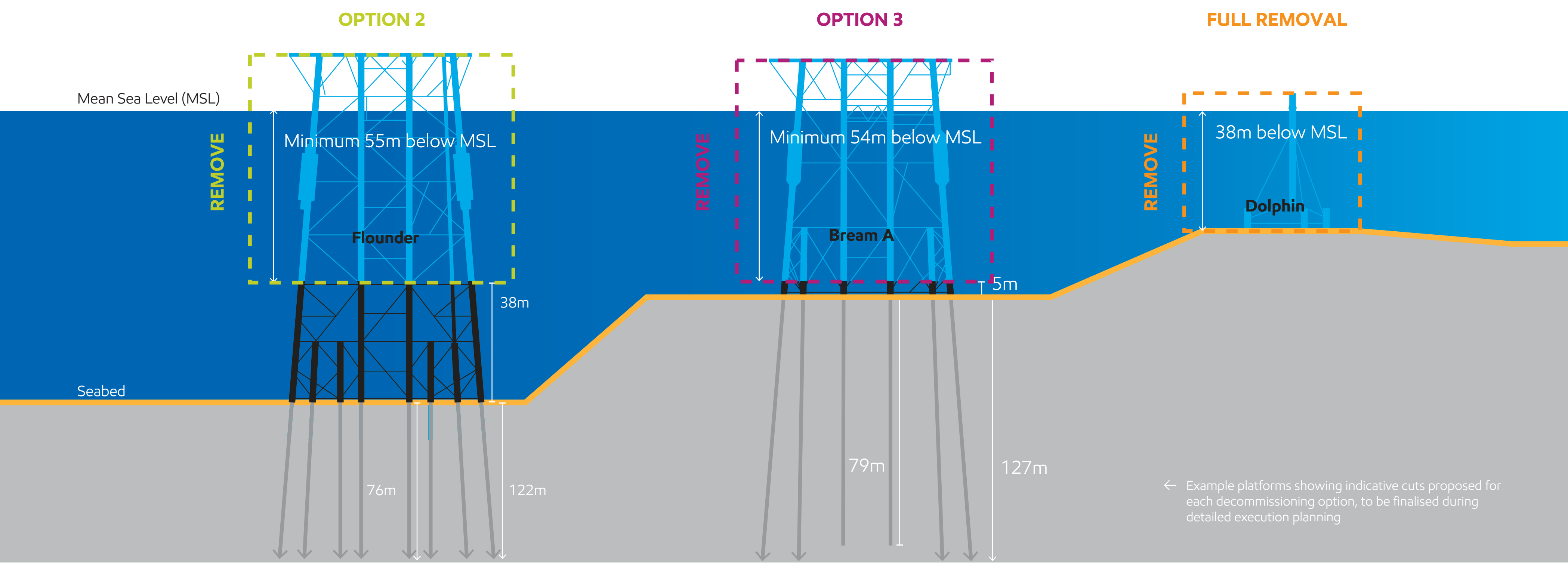
- Option 2: Cut the jacket to a minimum of 55m below Mean Sea Level, for eight steel jackets in deeper water.
- Option 3: Cut the jacket as close as practicable to the seabed, for two steel jackets in shallower water.
- Full removal: For decommissioning of the two monotowers.

Platform locations →

MAP LEGEND

- OPTION 2 DECOMMISSIONING
- OPTION 3 DECOMMISSIONING
- FULL REMOVAL DECOMMISSIONING
- OTHER ESSO AUSTRALIA FACILITY
- GAS PIPELINE
- LIQUID PIPELINE
- BATHYMETRY
- LOCALITY



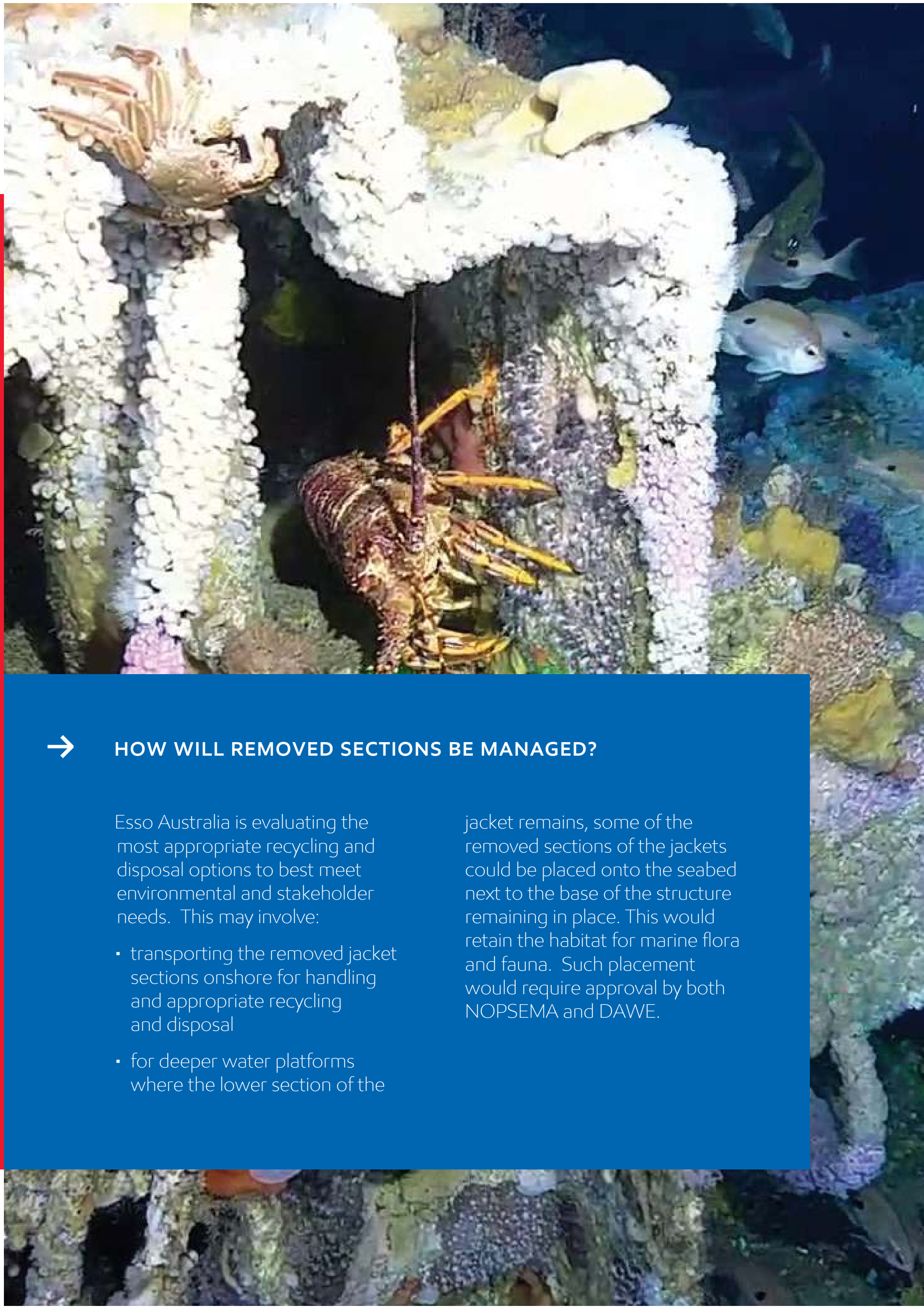


← Example platforms showing indicative cuts proposed for each decommissioning option, to be finalised during detailed execution planning

WHAT ARE THE BENEFITS OF THIS APPROACH?

Cut and remove steel jackets leaving a section of the jacket in place

Full removal of monotowers



Marine ecosystems established at 73.2 metres below Mean Sea Level on the Cobia platform

HOW WILL REMOVED SECTIONS BE MANAGED?

Esso Australia is evaluating the most appropriate recycling and disposal options to best meet environmental and stakeholder needs. This may involve:

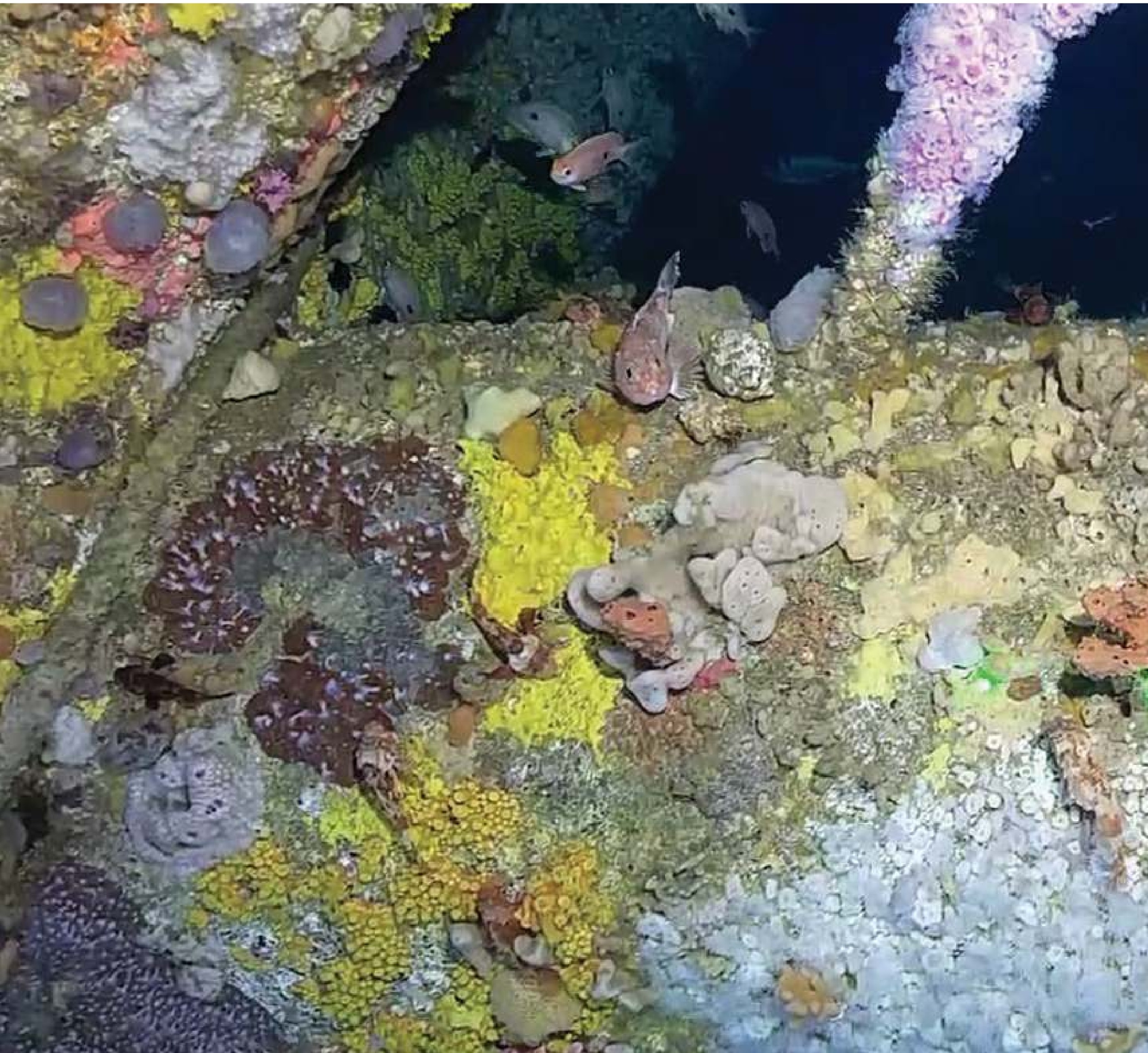
- transporting the removed jacket sections onshore for handling and appropriate recycling and disposal
- for deeper water platforms where the lower section of the jacket remains, some of the removed sections of the jackets could be placed onto the seabed next to the base of the structure remaining in place. This would retain the habitat for marine flora and fauna. Such placement would require approval by both NOPSEMA and DAWE.

Key impacts, risks and benefits of proposed decommissioning approach

	POTENTIAL IMPACT/RISK/BENEFIT		IMPACT/RISK REDUCTION AND MITIGATION MEASURES
	SHORT TERM	LONG TERM	
COMMERCIAL SHIPPING	No change as the locations of the infrastructure remaining in place are within the Area To Be Avoided where commercial shipping movements are restricted.	No impacts are expected as the water clearance over the infrastructure remaining in place will meet international guidelines and standards to ensure the safety of navigation.	Locations of infrastructure remaining in place will continue to be marked on navigational charts.
COMMERCIAL FISHING	No change while Petroleum Safety Zones remain in force.	The infrastructure remaining in place will not be overtrawlable. Commercial fishing activities involving trawling will need to continue to avoid the immediate footprint of the facilities.	Locations of infrastructure remaining in place will continue to be marked on navigational charts. Esso Australia is seeking to understand what arrangements might be possible instead of the currently gazetted Petroleum Safety Zones. The processes in place to address damage claims will remain unchanged while Esso Australia continues to operate in Bass Strait.
RECREATIONAL FISHING AND BOATING	No change while Petroleum Safety Zones remain in force.	Esso Australia is seeking to understand what alternate arrangements might be possible to provide enhanced access for recreational fishing around infrastructure remaining in place.	The water depth and unobstructed water column provided by the proposed approach will ensure the presence of the infrastructure remaining in place will not interfere with recreational boating and fishing activities.
POSSIBLE FUTURE INDUSTRIES	No change while Petroleum Safety Zones remain in force.	All approaches will result in displacement of future potential marine industries from the immediate footprint of the infrastructure remaining in place.	Esso Australia will continue to consult with relevant industry stakeholders. The small footprint of infrastructure proposed to remain in place, relative to the size of Bass Strait, suggests that impacts to future projects are expected to be minimal.
RETENTION OF THRIVING ECOSYSTEMS	Marine flora and fauna, such as anemone, sponges, crustaceans, sea urchins and sea stars, which almost completely cover the jacket structures, will be retained. Habitat and food sources for species such as fish, sharks and seals, which are observed in abundance around the jacket structures, will be partially retained.	The marine flora and fauna present on and around the infrastructure remaining in place will continue to contribute to the ecological richness and abundance of marine life in Bass Strait.	The proposed approach to retain some of the jacket in place (below 55m water depth) allows a balance between retaining as much marine life and habitat as possible, while meeting international guidelines and standards to ensure the safety of navigation.
MATERIAL DEGRADATION	Degradation of jacket material left in place leads to constituent metals dissolving into the surrounding water and sediment.	Degradation of jacket material remaining in place leads to constituent metals dissolving into the surrounding water and sediments, and eventual collapse of the structure, over many hundreds of years.	All sections of jackets with components or residues that could be harmful to marine flora and fauna will be transported onshore for handling and appropriate recycling and disposal. Material remaining in place will be limited to steel and concrete, which assessments have shown are not harmful to the marine environment.

Key impacts, risks, benefits and mitigation measures of possible placement of cut jacket sections in deeper water on the seabed

	POTENTIAL IMPACT/RISK/BENEFIT		IMPACT/RISK REDUCTION AND MITIGATION MEASURES
	SHORT TERM	LONG TERM	
COMMERCIAL SHIPPING	Locations of infrastructure remaining in place remains within the Area To Be Avoided where commercial shipping movements are restricted.	No impacts are expected, as the water clearance over the infrastructure remaining in place will meet international guidelines and standards to ensure the safety of navigation.	Locations of infrastructure remaining in place will continue to be marked on navigational charts.
COMMERCIAL FISHING	No change while Petroleum Safety Zones remain in force.	The placement of sections of cut jacket on the seabed will increase the footprint of the infrastructure remaining in place for some jackets. Commercial fishing activities involving trawling will need to continue to avoid the immediate footprint of the facilities.	Locations of infrastructure remaining in place will continue to be marked on navigational charts. The removed sections of jacket will be placed as close as practicable to the base of the remaining structure to minimise the area of seabed unavailable for commercial fishing activities involving trawling.
INJURY TO/ MORTALITY OF SESSILE BIOTA	Marine life established at higher points on the jacket structure may be lost when the structure is placed on the seabed due to the change in conditions, such as light and nutrients, in deeper water.	Recolonisation of the jacket structure over time would occur with other marine life suited to seabed depth.	Placement of cut jacket sections on the seabed is expected to increase the overall habitat available for sessile biota, by the provision of additional hard substrate on the seabed, much like we can see today on the existing jacket structures.
CHANGE IN FISH HABITAT	Habitat for mobile species such as certain fish which require specific conditions such as light and food sources present on the higher points of the jacket structure will be lost.	Mobile species such as fish will either move downward on the remaining jacket structure if conditions are suitable, or migrate to other habitats.	Placement of the cut jacket sections on the seabed will increase the overall habitat and food source availability for mobile species such as fish.
DISTURBANCE DURING PLACEMENT	Physical impact (including smothering) may lead to a localised and minor loss of benthic infauna within the seabed sediments and/or alteration of their habitat.	No long term impacts to benthic infauna are expected.	Impacts to benthic infauna will be limited to the immediate footprint of the placed jacket sections, hence expected to be minor, short term and localised.
CHANGE IN WATER QUALITY DURING PLACEMENT	Suspension of sediments and the subsequent change in water quality may impact marine life by smothering or exposure to potential contaminants in the sediments.	No long term impacts to water quality are expected.	Any impacts to marine life due to the temporary suspension of sediments during placement activities are expected to be short term, minor and localised.



ExxonMobil

Esso Australia aims to keep government, non-government organisations and community stakeholders informed about decommissioning activities.

We welcome feedback and will continue to keep interested stakeholders updated about proposed activities throughout the planning phase and into the execution phase.

For further information, please contact our stakeholder engagement team at:

consultation@exxonmobil.com

Alternatively, our Head Office for the ExxonMobil companies in Australia can be contacted by calling:

+61 3 9261 0000

or writing to:

GPO Box 400 Melbourne VIC 3001

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Appendix C3 Media coverage

Esso gears up for Bass Strait decommissioning

Angela Macdonald-Smith *Senior resources writer*
Feb 7, 2022 – 1.45pm

ExxonMobil is stepping up preparations for the next phase of the multibillion-dollar decommissioning of the extensive offshore oil and gas infrastructure at mature fields in the Bass Strait, with a specialist vessel due to arrive mid-year to support the work.

Under a contract announced in Norway on Friday by DOF Subsea, Esso, the operator and 50 per cent owner of the Gippsland Basin joint venture, has chartered the vessel for three years, with options to extend the arrangement for another two years.

Esso is still bringing on new gas projects as it seeks to slow the decline in output from the Bass Strait.

Esso Australia confirmed the contract award over the weekend, saying that the Perch and Dolphin facilities in the Bass Strait would be the initial focus of the rehabilitation work.

Esso has already completed about $600 million of early decommissioning work in the Bass Strait, but the bulk of the work lies ahead. The total bill for oil and gas rehabilitation costs in the Gippsland Basin was estimated in 2020 at about $US10.4 billion by the Centre of Decommissioning Australia.

Concerns about decommissioning work have been growing in recent years, especially since the fiasco with the disused Northern Endeavour vessel in the Timor Sea, where the bill for rehabilitation initially fell on Australian taxpayers after the company involved fell into administration. An industry levy has since been introduced by the federal government to pay for the work.

Oil and gas rehabilitation costs have also been a focus for the market in the proposed $41 billion merger between Woodside Petroleum and BHP's petroleum business, which owns the other 50 per cent of the Bass Strait joint venture with Esso.

However. BHP last September flagged the cost for remediation at its oil and gas fields at $US3.9 billion, less than some analysts had feared when they assessed the liabilities that Woodside will be taking on.

Exxon in 2016 started a process of trying to sell its stake in the Gippsland Basin joint venture, but called off the attempt in 2020 after failing to attract the price it wanted. Industry sources said then that looming decommissioning liabilities likely made a sale more difficult, as well as the complex tax arrangements surrounding the venture.

ExxonMobil Australia chairman Dylan Pugh said the complex process of safely decommissioning offshore facilities required many years of planning.

He said the decommissioning work completed by Esso included the removal of the Seahorse and Tarwhine facilities last year, and the completion of the abandonment of the Blackback and Whiting wells. Work is also progressing to decommission the Kingfish B and Mackerel facilities.

"As we continue to progress these important, early decommissioning works, we are also planning for the eventual decommissioning of our facilities that are to cease production in the near future," he said.

Mr Pugh noted that at the same time as planning the decommissioning work, Esso was continuing to assess new projects in the Bass Strait, "with the aim of extending our production of Gippsland gas into the next decade".

Esso last year brought online its $600 million West Barracouta offshore project, one of the largest new domestic gas projects this decade, but the region is facing a decline in production over the next few years, the Australian Energy Market Operator has advised.

DOF chief executive Mons Aase said the contract with Esso was the second long-term contract with the firm and is “a very important win for us”.

Meanwhile, a tightening-up of Australia’s rules for the transfer of offshore petroleum titles, triggered by the Northern Endeavour crisis, appears to have started to have an effect. Oil and gas junior Pilot Energy last week scrapped a deal to sell a majority stake in an offshore permit to Triangle Energy after being advised by the National Offshore Petroleum Titles Administrator that it intended to block the transfer, as it was not satisfied that Triangle “had demonstrated sufficient financial resources to meet the obligations” associated with the permit.

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Dispute looms over clean-up of Bass Strait platforms

The steel structures that support the rigs are deeply embedded into the ocean floor

ERIC JOHNSTON
ASSOCIATE EDITOR

Australia's offshore oil and gas regulator is set for a major test as global oil giant ExxonMobil prepares for the complicated task of dismantling nearly a dozen ageing oil and gas platforms in the Bass Strait.

ExxonMobil, one of the owners of the Gippsland Basin joint venture Esso Australia, has argued that because some of the platforms are as much as 60 years old, they have become part of the marine environment.

It also claims some of the platform structures were designed never to be removed and can withstand wild Bass Strait storms, which means it would be highly risky to dismantle the steel supports below the surface of the ocean.

The arguments have come about despite rules in place requiring the "complete removal" of all offshore gas and oil structures at the end of their life.

For Esso Australia which oversees the project, the partial dismantling of the platforms would represent a significantly lower cost than removing all steel supports, including those beneath the

Continued on Page 23

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Dispute looms over clean-up of Bass Strait oil platforms

Continued from Page 15

ocean floor. Indeed, some structures have been embedded more than 150 metres into the ground below the seabed.

The arguments have been made in a 660-page environmental plan to the National Offshore Petroleum Safety and Environmental Management Authority which has been made available for public consultation. Plans for decommissioning are not usually released for public comment, but in this case Esso Australia has asked for it to be made available.

"Esso has not been able to establish any Australian or international precedents of (platform) foundation piles being removed to their full extent beneath the seabed," it says in the submission.

"Given the lack of precedents and the technical issues outlined, a reliable and safe execution method has not been established for this activity. If such a method could theoretically be engineered, the configuration and number of the piles to be removed ... would likely require an execution duration of many years and vast seabed and ecosystem disturbance to allow access to all piles for cutting and removal".

NOPSEMA will be forced to rule on the proposal with the agency still dealing with the fallout from the collapse of the company behind the Northern Endeavour oil ship in the Timor Sea, leaving taxpayers footing hundreds of million of dollars in clean-up costs.

A recent report commissioned by National Energy Resources Australia found there is $52bn of decommissioning work on Australia's offshore oil and gas infrastructure that still needs to be completed. Half of this is earmarked to begin over the next decade.

There is no suggestion of a funding shortfall for Esso Australia given the joint ownership by ExxonMobil and ASX-listed Woodside Petroleum. Some fields remain in production.

While a joint venture, ExxonMobil is very much in the driver's seat in the Gippsland Basin, with Woodside inheriting the maturing gas fields last year as part of its $40bn merger with BHP's petroleum arm.

Through its merger with BHP Petroleum, Woodside has set aside as much as $2.7bn for decommissioning costs until the end of the decade, although that also includes operations in the North West Shelf as well as Bass Strait.

For eight of the platforms including the massive Kingfish structure, Esso is proposing to cut the footings the platforms sit on so there is 55 metres of clearance between the ocean and the steel structure sitting on the ocean floor. For another two platforms Esso is planning to cut them as close as possible to the seabed.

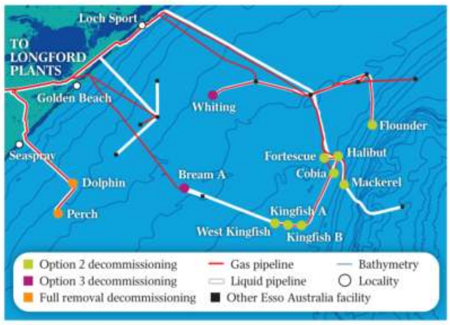
It is still considering how to dispose of the main platforms, with the options being transporting them onshore where they will be cut down or placing some of the sections on the seabed next to the steel footings.

The plan doesn't detail exactly how the works will be carried out given that they will be subject to a separate review and approval process by the regulator.

The dismantling of the platforms is also a stark symbol of how the Bass Strait gas reserves that have powered Australia's east coast for the past 50 years are fast running out.

Under the venture some 10 platforms, three subsea facilities, 16 pipelines and approximately half of all wells drilled are no longer producing oil and gas.

Decommissioning oil rigs is an expensive and lengthy process



Esso is planning for the first wave of dismantling to start from 2027. Work already underway includes the plugging of wells that have stopped production and basic work is underway for the preparation of the removal of the platforms.

Esso says further decommissioning will be required in the future, with another 13 platforms sitting in Bass Strait still producing gas, using a network of 600km of underwater pipes. This is why it is keen to get an initial ruling on the partial dismantling.

For its part Esso warns damage from the removal of the platforms is likely to cause significant harm to the seabed and potentially leakage into the water. It argues the facilities were installed in a different era where they weren't planned to be removed.

"In order to ensure the integrity of wells producing to the facilities, the (platforms) were designed to withstand 1-in-100-year storm events and the depth and design of the deep foundation piles reflects this," it says in its submission.

"The consequence of this design is that these deep foundation piles were engineered to provide a strong, secure, and enduring bond with the soil.

"Future removal was not a consideration of the design standards of the day and no feasible method of complete removal at depth has been identified."

While the waters where the wells are located fall outside Victoria's three nautical mile coastal water claim, the state government has a strong interest in seeing the fields fully restored. Pipeline infrastructure and the Longford processing facility are captured by Victorian environmental regulations while the state regulator also oversees fisheries.

A spokesman for Esso Australia said the energy company was committed to decommissioning the Bass Strait offshore facilities "safely and effectively".

"We are managing the decline in Bass Strait oil and gas production by streamlining our operations, transitioning from Australia's oldest oil and gas business to a modern Australian gas company, which will continue to provide local employment opportunities for years to come," he said.

The spokesman said detailed evaluation and assessment has highlighted the options, which "balance the retention of the extensive ecosystems that have developed on and around the platforms since their installation with the needs of communities, government and non-government stakeholders".

NOPSEMA, which declined to comment, has issued a tight window for feedback with submissions closing at the end of this month.

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Esso clean-up underway

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Esso clean-up underway

A MULTI-purpose Support Vessel has arrived at Barry Beach Marine Terminal to support Esso Australia's decommissioning efforts.

The Skandi Darwin started work on Thursday, August 11.

The vessel has been fitted with a remote-operated vehicle, a heave-compensated crane, a helideck and on-board living quarters

It also contains a walk-to-work gangway system, allowing work crews to easily transfer from the vessel to the offshore rigs.

The arrival of the Skandi Darwin comes after the signing of a multi-year agreement between Esso and Norwegian company DOF Subsea, and is the second such vessel to be added to Esso's fleet.

It is the latest step in the company's years-long plan to decommission a number of its offshore facilities in Bass Strait.

**Employees and representatives of Esso Australia welcoming the Skandi Darwin to Barry Beach.
Photo: Contributed**

Appendix D1 EPBC Act search report

Protected Matters Search Tool

WTA

Report Generated - 6:23PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	38
Listed Migratory Species	39

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	59
Whales and Other Cetaceans	13
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	6
Key Ecological Features	0
Biologically Important Areas	12
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64438	*Fregetta grallaria grallaria*	White-bellied Storm-	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Listed Migratory Species

Species ID	Scientific Name	Common Name	Class	Presence		Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
				Rank	Text							
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
39	*Caperea marginata*	Pygmy Right Whale	Mammal	May	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
84108	*Carcharhinus longimanus*	Oceanic Whitetip Shark	Shark	May	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In buffer area only
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area

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Listed Marine Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
66233	*Hippocampus*	Big-belly Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66275	*Solegnathus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area

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Whales and Other Cetaceans

				Presence								
Species ID	**Scientific Name**	**Common Name**	**Class**	**Rank**	**Text**	**Threatened Category**	**Migratory Status**	**Migratory Category**	**Marine Status**	**Cetacean Status**	**Website**	**Buffer Status**
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
39	*Caperea marginata*	Pygmy Right Whale	Mammal	May	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/2556	Bream 3D seismic survey	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2001/140	Northern Fields 3D Seismic	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1866	Gippsland Basin Seismic	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area

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Biologically Important Areas

Species ID	**Scientific Name**	**Common Name**	**Species Group**	**Behaviour**	**Presence**	**Website**	**Buffer Status**
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

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Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may 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.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Department of Agriculture, Water and the Environment

Protected Matters Search Tool

BMA

Report Generated - 6:31PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	39
Listed Migratory Species	38

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	59
Whales and Other Cetaceans	13
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	11
Key Ecological Features	0
Biologically Important Areas	15
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
26179	*Prototroctes maraena*	Australian Grayling	Fish	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Breeding known to occur	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64438	*Fregetta grallaria grallaria*	White-bellied Storm-	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Listed Migratory Species

Species ID	Scientific Name	Common Name	Class	Presence Rank	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Breeding known to occur	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Foraging, feeding or		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
39	*Caperea marginata*	Pygmy Right Whale	Mammal	May	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Listed Marine Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
66233	*Hippocampus*	Big-belly Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66275	*Solegnathus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Foraging, feeding or		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Whales and Other Cetaceans

Species ID	Scientific Name	Common Name	Class	Presence		Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
				Rank	Text							
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
39	*Caperea marginata*	Pygmy Right Whale	Mammal	May	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2010/5288	Southern Flanks 2D	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/2556	Bream 3D seismic survey	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1866	Gippsland Basin Seismic	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/140	Northern Fields 3D Seismic	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/3146	Apache 3D seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/206	Seismic Survey	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2007/3915	West Triton Drilling	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2000/20	Gas Pipeline	VIC	Energy Generation and	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area

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Biologically Important Areas

Species ID	Scientific Name	Common Name	Species Group	Behaviour	Presence	Website	Buffer Status
82652	Ardenna tenuirostris	Short-tailed Shearwater	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Breeding (nursery area)	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

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Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may 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.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Department of Agriculture, Water and the Environment

Protected Matters Search Tool

WKF

Report Generated - 6:36PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	39
Listed Migratory Species	41

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	60
Whales and Other Cetaceans	14
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	12
Key Ecological Features	0
Biologically Important Areas	14
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area
64438	*Fregetta grallaria grallaria*	White-bellied Storm-	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area

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Listed Migratory Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
39	*Caperea marginata*	Pygmy Right Whale	Mammal	May	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
84108	*Carcharhinus longimanus*	Oceanic Whitetip Shark	Shark	May	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Foraging, feeding or		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area

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Listed Marine Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66275	*Solegnathus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66233	*Hippocampus*	Big-belly Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Foraging, feeding or		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area

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Whales and Other Cetaceans

				Presence								
Species ID	**Scientific Name**	**Common Name**	**Class**	**Rank**	**Text**	**Threatened Category**	**Migratory Status**	**Migratory Category**	**Marine Status**	**Cetacean Status**	**Website**	**Buffer Status**
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
39	*Caperea marginata*	Pygmy Right Whale	Mammal	May	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2001/177	Hemingway1/Oil	CM	Mining	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2010/5288	Southern Flanks 2D	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/167	Melville 1 Oil Exploration	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1866	Gippsland Basin Seismic	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/206	Seismic Survey	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/3146	Apache 3D seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2007/3915	West Triton Drilling	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/289	Offshore Petroleum	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/2556	Bream 3D seismic survey	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area

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Biologically Important Areas

Species ID	**Scientific Name**	**Common Name**	**Species Group**	**Behaviour**	**Presence**	**Website**	**Buffer Status**
82652	Ardenna tenuirostris	Short-tailed Shearwater	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

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Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may 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.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Department of Agriculture, Water and the Environment

Protected Matters Search Tool

KFA

Report Generated - 6:41PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	39
Listed Migratory Species	41

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	60
Whales and Other Cetaceans	14
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	12
Key Ecological Features	0
Biologically Important Areas	14
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area
64438	*Fregetta grallaria grallaria*	White-bellied Storm-	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area

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Listed Migratory Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
39	*Caperea marginata*	Pygmy Right Whale	Mammal	May	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
84108	*Carcharhinus longimanus*	Oceanic Whitetip Shark	Shark	May	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Foraging, feeding or		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area

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Listed Marine Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		[Species Profile and Threat](#)	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		[Species Profile and Threat](#)	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66275	*Solegnathus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta		[Species Profile and Threat](#)	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		[Species Profile and Threat](#)	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		[Species Profile and Threat](#)	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		[Species Profile and Threat](#)	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		[Species Profile and Threat](#)	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		[Species Profile and Threat](#)	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		[Species Profile and Threat](#)	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		[Species Profile and Threat](#)	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
66233	*Hippocampus*	Big-belly Seahorse,	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		[Species Profile and Threat](#)	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		[Species Profile and Threat](#)	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		[Species Profile and Threat](#)	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Foraging, feeding or		Migratory	Migratory Marine Birds	Listed (as Puffinus		[Species Profile and Threat](#)	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		[Species Profile and Threat](#)	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		[Species Profile and Threat](#)	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		[Species Profile and Threat](#)	In feature area

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Whales and Other Cetaceans

				Presence								
Species ID	**Scientific Name**	**Common Name**	**Class**	**Rank**	**Text**	**Threatened Category**	**Migratory Status**	**Migratory Category**	**Marine Status**	**Cetacean Status**	**Website**	**Buffer Status**
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
39	*Caperea marginata*	Pygmy Right Whale	Mammal	May	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2001/177	Hemingway1/Oil	CM	Mining	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2010/5288	Southern Flanks 2D	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/167	Melville 1 Oil Exploration	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1866	Gippsland Basin Seismic	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/206	Seismic Survey	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/3146	Apache 3D seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2007/3915	West Triton Drilling	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/289	Offshore Petroleum	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/2556	Bream 3D seismic survey	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area

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Biologically Important Areas

Species ID	Scientific Name	Common Name	Species Group	Behaviour	Presence	Website	Buffer Status
82652	Ardenna tenuirostris	Short-tailed Shearwater	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

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Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may 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.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Department of Agriculture, Water and the Environment

Protected Matters Search Tool

KFB

Report Generated - 6:46PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	42
Listed Migratory Species	42

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	59
Whales and Other Cetaceans	28
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	12
Key Ecological Features	0
Biologically Important Areas	15
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68444	*Centrophorus harrissoni*	Harrisson's Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68455	*Hoplostethus atlanticus*	Orange Roughy, Deep-sea	Fish	May	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
82679	*Centrophorus zeehaani*	Southern Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
76339	*Rexea solandri (eastern*	Eastern Gemfish	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Species or species habitat	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64438	*Fregetta grallaria grallaria*	White-bellied Storm-	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area

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Listed Migratory Species

Species ID	Scientific Name	Common Name	Class	Presence Rank	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
84108	*Carcharhinus longimanus*	Oceanic Whitetip Shark	Shark	May	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Listed Marine Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta		Species Profile and Threat	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66275	*Solegnathus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Species or species habitat	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66233	*Hippocampus*	Big-belly Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area

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Whales and Other Cetaceans

				Presence								
Species ID	**Scientific Name**	**Common Name**	**Class**	**Rank**	**Text**	**Threatened Category**	**Migratory Status**	**Migratory Category**	**Marine Status**	**Cetacean Status**	**Website**	**Buffer Status**
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
54	*Mesoplodon mirus*	True's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
57	*Kogia breviceps*	Pygmy Sperm Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
70	*Berardius arnuxii*	Arnoux's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
73	*Mesoplodon bowdoini*	Andrew's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
74	*Mesoplodon densirostris*	Blainville's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
76	*Mesoplodon hectori*	Hector's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
44	*Lissodelphis peronii*	Southern Right Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
56	*Ziphius cavirostris*	Cuvier's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
25556	*Mesoplodon layardii*	Strap-toothed Beaked	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
85043	*Kogia sima*	Dwarf Sperm Whale	Mammal	May	Species or species habitat					Cetacean (as Kogia simus)	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59282	*Globicephala melas*	Long-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
62	*Globicephala*	Short-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1876	2D seismic Survey in	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/289	Offshore Petroleum	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/525	Seismic survey, Gippsland	VIC	Mining	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/775	Non-exclusive 3-D Marine	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/864	Tuskfish 3D Seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2010/5288	Southern Flanks 2D	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/140	Northern Fields 3D Seismic	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2007/3915	West Triton Drilling	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/3146	Apache 3D seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area

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Biologically Important Areas

Species ID	**Scientific Name**	**Common Name**	**Species Group**	**Behaviour**	**Presence**	**Website**	**Buffer Status**
82652	Ardenna tenuirostris	Short-tailed Shearwater	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

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Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may 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.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Protected Matters Search Tool

MKA

Report Generated - 7:12PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	42
Listed Migratory Species	42

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	59
Whales and Other Cetaceans	28
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	12
Key Ecological Features	0
Biologically Important Areas	15
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68444	*Centrophorus harrissoni*	Harrisson's Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68455	*Hoplostethus atlanticus*	Orange Roughy, Deep-sea	Fish	May	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
82679	*Centrophorus zeehaani*	Southern Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
76339	*Rexea solandri (eastern*	Eastern Gemfish	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Species or species habitat	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64438	*Fregetta grallaria grallaria*	White-bellied Storm-	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area

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Listed Migratory Species

				Presence								
Species ID	**Scientific Name**	**Common Name**	**Class**	**Rank**	**Text**	**Threatened Category**	**Migratory Status**	**Migratory Category**	**Marine Status**	**Cetacean Status**	**Website**	**Buffer Status**
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
84108	*Carcharhinus longimanus*	Oceanic Whitetip Shark	Shark	May	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Listed Marine Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta		Species Profile and Threat	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66275	*Solegnathus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Species or species habitat	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66233	*Hippocampus*	Big-belly Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area

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Whales and Other Cetaceans

				Presence								
Species ID	**Scientific Name**	**Common Name**	**Class**	**Rank**	**Text**	**Threatened Category**	**Migratory Status**	**Migratory Category**	**Marine Status**	**Cetacean Status**	**Website**	**Buffer Status**
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
54	*Mesoplodon mirus*	True's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
57	*Kogia breviceps*	Pygmy Sperm Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
70	*Berardius arnuxii*	Arnoux's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
73	*Mesoplodon bowdoini*	Andrew's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
74	*Mesoplodon densirostris*	Blainville's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
76	*Mesoplodon hectori*	Hector's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
44	*Lissodelphis peronii*	Southern Right Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
56	*Ziphius cavirostris*	Cuvier's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
25556	*Mesoplodon layardii*	Strap-toothed Beaked	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
85043	*Kogia sima*	Dwarf Sperm Whale	Mammal	May	Species or species habitat					Cetacean (as Kogia simus)	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59282	*Globicephala melas*	Long-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
62	*Globicephala*	Short-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1876	2D seismic Survey in	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/289	Offshore Petroleum	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/525	Seismic survey, Gippsland	VIC	Mining	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/775	Non-exclusive 3-D Marine	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/864	Tuskfish 3D Seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2010/5288	Southern Flanks 2D	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/140	Northern Fields 3D Seismic	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2007/3915	West Triton Drilling	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/3146	Apache 3D seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area

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Biologically Important Areas

Species ID	Scientific Name	Common Name	Species Group	Behaviour	Presence	Website	Buffer Status
82652	Ardenna tenuirostris	Short-tailed Shearwater	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

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Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may 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.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Department of Agriculture, Water and the Environment

Protected Matters Search Tool

CBA

Report Generated - 7:07PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	43
Listed Migratory Species	43

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	60
Whales and Other Cetaceans	28
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	25
Key Ecological Features	1
Biologically Important Areas	15
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68444	*Centrophorus harrissoni*	Harrisson's Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68455	*Hoplostethus atlanticus*	Orange Roughy, Deep-sea	Fish	May	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
82679	*Centrophorus zeehaani*	Southern Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
76339	*Rexea solandri (eastern*	Eastern Gemfish	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In buffer area only
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64438	*Fregetta grallaria grallaria*	White-bellied Storm-	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area

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Listed Migratory Species

Species ID	Scientific Name	Common Name	Class	Presence Rank	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In buffer area only
84108	*Carcharhinus longimanus*	Oceanic Whitetip Shark	Shark	May	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Listed Marine Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta		Species Profile and Threat	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66275	*Solegnathus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In buffer area only
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66233	*Hippocampus*	Big-belly Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area

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Whales and Other Cetaceans

Species ID	Scientific Name	Common Name	Class	Presence		Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
				Rank	Text							
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
54	*Mesoplodon mirus*	True's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
57	*Kogia breviceps*	Pygmy Sperm Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
70	*Berardius arnuxii*	Arnoux's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
73	*Mesoplodon bowdoini*	Andrew's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
74	*Mesoplodon densirostris*	Blainville's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
76	*Mesoplodon hectori*	Hector's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
44	*Lissodelphis peronii*	Southern Right Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
56	*Ziphius cavirostris*	Cuvier's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
25556	*Mesoplodon layardii*	Strap-toothed Beaked	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
85043	*Kogia sima*	Dwarf Sperm Whale	Mammal	May	Species or species habitat					Cetacean (as Kogia simus)	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
59282	*Globicephala melas*	Long-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
62	*Globicephala*	Short-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2007/3915	West Triton Drilling	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/864	Tuskfish 3D Seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1535	Drilling and side track	CM	Mining	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2012/6362	Inspection of project	CM	Transport - Water	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2006/3072	Longtom Gas Pipeline	CM	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2002/775	Non-exclusive 3-D Marine	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1204	Development of Turrum	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2010/5288	Southern Flanks 2D	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2012/6413	Longtom-5 Offshore	VIC	Energy Generation and	Completed	Withdrawn	Referral Decision	EPBC Referral Detail	In buffer area only
2011/6217	Longtom South -1	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2004/1866	Gippsland Basin Seismic	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2012/6498	Longtom-5 Offshore	CM	Energy Generation and	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2001/525	Seismic survey, Gippsland	VIC	Mining	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/289	Offshore Petroleum	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2012/6404	Longtom 5 Offshore	VIC	Energy Generation and	Completed	Withdrawn	Referral Decision	EPBC Referral Detail	In buffer area only
2006/3146	Apache 3D seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1876	2D seismic Survey in	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/140	Northern Fields 3D Seismic	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/3197	Marlin-Snapper Gas	CM	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2008/4191	Turrum Phase 2	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2005/2494	Longtom-3 Gas Appraisal	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2005/2484	Development of Kipper	CM	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only

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Key Ecological Features

Name	Region	Website	Buffer Status
Upwelling East of Eden	South-east	Key Ecological Feature	In buffer area only

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Biologically Important Areas

Species ID	Scientific Name	Common Name	Species Group	Behaviour	Presence	Website	Buffer Status
82652	Ardenna tenuirostris	Short-tailed Shearwater	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

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Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may 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.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Protected Matters Search Tool

HLA

Report Generated - 7:02PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	43
Listed Migratory Species	43

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	60
Whales and Other Cetaceans	28
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	25
Key Ecological Features	1
Biologically Important Areas	15
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68444	*Centrophorus harrissoni*	Harrisson's Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68455	*Hoplostethus atlanticus*	Orange Roughy, Deep-sea	Fish	May	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
82679	*Centrophorus zeehaani*	Southern Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
76339	*Rexea solandri (eastern*	Eastern Gemfish	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In buffer area only
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64438	*Fregetta grallaria grallaria*	White-bellied Storm-	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area

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Listed Migratory Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In buffer area only
84108	*Carcharhinus longimanus*	Oceanic Whitetip Shark	Shark	May	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Listed Marine Species

				Presence								
Species ID	**Scientific Name**	**Common Name**	**Class**	**Rank**	**Text**	**Threatened Category**	**Migratory Status**	**Migratory Category**	**Marine Status**	**Cetacean Status**	**Website**	**Buffer Status**
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta		Species Profile and Threat	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66491	*Thalassarche*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66275	*Solegnathus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89224	*Thalassarche cauta*	Shy Albatross	Bird	Likely	Foraging, feeding or	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In buffer area only
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66233	*Hippocampus*	Big-belly Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area

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Whales and Other Cetaceans

Species ID	Scientific Name	Common Name	Class	Presence Rank	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
54	*Mesoplodon mirus*	True's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
57	*Kogia breviceps*	Pygmy Sperm Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
70	*Berardius arnuxii*	Arnoux's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
73	*Mesoplodon bowdoini*	Andrew's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
74	*Mesoplodon densirostris*	Blainville's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
76	*Mesoplodon hectori*	Hector's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
44	*Lissodelphis peronii*	Southern Right Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
56	*Ziphius cavirostris*	Cuvier's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
25556	*Mesoplodon layardii*	Strap-toothed Beaked	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
85043	*Kogia sima*	Dwarf Sperm Whale	Mammal	May	Species or species habitat					Cetacean (as Kogia simus)	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
59282	*Globicephala melas*	Long-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
62	*Globicephala*	Short-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2007/3915	West Triton Drilling	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/864	Tuskfish 3D Seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1535	Drilling and side track	CM	Mining	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2012/6362	Inspection of project	CM	Transport - Water	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2006/3072	Longtom Gas Pipeline	CM	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2002/775	Non-exclusive 3-D Marine	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1204	Development of Turrum	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2010/5288	Southern Flanks 2D	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2012/6413	Longtom-5 Offshore	VIC	Energy Generation and	Completed	Withdrawn	Referral Decision	EPBC Referral Detail	In buffer area only
2011/6217	Longtom South -1	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2004/1866	Gippsland Basin Seismic	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2012/6498	Longtom-5 Offshore	CM	Energy Generation and	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2001/525	Seismic survey, Gippsland	VIC	Mining	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/289	Offshore Petroleum	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2012/6404	Longtom 5 Offshore	VIC	Energy Generation and	Completed	Withdrawn	Referral Decision	EPBC Referral Detail	In buffer area only
2006/3146	Apache 3D seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1876	2D seismic Survey in	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/140	Northern Fields 3D Seismic	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/3197	Marlin-Snapper Gas	CM	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2008/4191	Turrum Phase 2	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2005/2494	Longtom-3 Gas Appraisal	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only
2005/2484	Development of Kipper	CM	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In buffer area only

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Key Ecological Features

Name	Region	Website	Buffer Status
Upwelling East of Eden	South-east	Key Ecological Feature	In buffer area only

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Biologically Important Areas

Species ID	Scientific Name	Common Name	Species Group	Behaviour	Presence	Website	Buffer Status
82652	Ardenna tenuirostris	Short-tailed Shearwater	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

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Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may 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.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Department of Agriculture, Water and the Environment

Protected Matters Search Tool

FTA

Report Generated - 6:54PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	42
Listed Migratory Species	42

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	59
Whales and Other Cetaceans	28
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	12
Key Ecological Features	0
Biologically Important Areas	15
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68444	*Centrophorus harrissoni*	Harrison's Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68455	*Hoplostethus atlanticus*	Orange Roughy, Deep-sea	Fish	May	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
82679	*Centrophorus zeehaani*	Southern Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
76339	*Rexea solandri (eastern*	Eastern Gemfish	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche chrysostoma*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Species or species habitat	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64438	*Fregetta grallaria*	White-bellied Storm-Petrel	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area

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Listed Migratory Species

				Presence								
Species ID	**Scientific Name**	**Common Name**	**Class**	**Rank**	**Text**	**Threatened Category**	**Migratory Status**	**Migratory Category**	**Marine Status**	**Cetacean Status**	**Website**	**Buffer Status**
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche chrysostoma*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel Shark	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
84108	*Carcharhinus longimanus*	Oceanic Whitetip Shark	Shark	May	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Listed Marine Species

				Presence								
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta skua)		Species Profile and Threat	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66491	*Thalassarche chrysostoma*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66275	*Solegnathus spinosissimus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Species or species habitat	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66233	*Hippocampus*	Big-belly Seahorse, Eastern	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area

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Whales and Other Cetaceans

				Presence									
Species ID	Scientific Name	Common Name	Class	Rank	Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
54	*Mesoplodon mirus*	True's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
57	*Kogia breviceps*	Pygmy Sperm Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
70	*Berardius arnuxii*	Arnoux's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
73	*Mesoplodon bowdoini*	Andrew's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
74	*Mesoplodon densirostris*	Blainville's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
76	*Mesoplodon hectori*	Hector's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
44	*Lissodelphis peronii*	Southern Right Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
56	*Ziphius cavirostris*	Cuvier's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
25556	*Mesoplodon layardii*	Strap-toothed Beaked	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
85043	*Kogia sima*	Dwarf Sperm Whale	Mammal	May	Species or species habitat					Cetacean (as Kogia simus)	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59282	*Globicephala melas*	Long-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
62	*Globicephala*	Short-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1876	2D seismic Survey in	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/289	Offshore Petroleum	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/525	Seismic survey, Gippsland	VIC	Mining	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/775	Non-exclusive 3-D Marine	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/864	Tuskfish 3D Seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2010/5288	Southern Flanks 2D	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/140	Northern Fields 3D Seismic	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2007/3915	West Triton Drilling	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/3146	Apache 3D seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area

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Biologically Important Areas

Species ID	Scientific Name	Common Name	Species Group	Behaviour	Presence	Website	Buffer Status
82652	Ardenna tenuirostris	Short-tailed Shearwater	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

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Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may 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.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Protected Matters Search Tool

FLA

Report Generated - 7:18PM - 27 December 2021

Matters of National Environment Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	0
Great Barrier Reef Marine Park	0
Commonwealth Marine Area	1
Listed Threatened Ecological Communities	0
Listed Threatened Species	42
Listed Migratory Species	42

Other Matters Protected by the EPBC Act	Count
Commonwealth Lands	0
Commonwealth Heritage Places	0
Listed Marine Species	59
Whales and Other Cetaceans	28
Critical Habitats	0
Commonwealth Reserves Terrestrial	0
Australian Marine Parks	0
Habitat Critical to the Survival of Marine Turtles	0

Extra Information	Count
State and Territory Reserves	0
Regional Forest Agreements	0
Nationally Important Wetlands	0
EPBC Act Referrals	12
Key Ecological Features	0
Biologically Important Areas	15
Bioregional Assessments	0
Geological and Bioregional Assessments	0

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 and is accurate at the time of generation.
Please see the caveat for interpretation of information provided here. Consider carefully the age of information for decision making.

Report Metadata	Caveat

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Commonwealth Marine Area

Feature Name	Buffer Status
EEZ and Territorial Sea	In feature area

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Listed Threatened Species

Species ID	Scientific Name	Common Name	Class	Simple Presence	Presence Text	Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
69374	*Seriolella brama*	Blue Warehou	Fish	Known	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
69402	*Thunnus maccoyii*	Southern Bluefin Tuna	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68444	*Centrophorus harrissoni*	Harrison's Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68453	*Galeorhinus galeus*	School Shark, Eastern	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
68455	*Hoplostethus atlanticus*	Orange Roughy, Deep-sea	Fish	May	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
82679	*Centrophorus zeehaani*	Southern Dogfish,	Shark	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
76339	*Rexea solandri (eastern*	Eastern Gemfish	Fish	Likely	Species or species habitat	Conservation Dependent					Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66491	*Thalassarche chrysostoma*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
26033	*Pterodroma leucoptera*	Gould's Petrel, Australian	Bird	May	Species or species habitat	Endangered					Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
64445	*Pachyptila turtur*	Fairy Prion (southern)	Bird	May	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Species or species habitat	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64438	*Fregetta grallaria*	White-bellied Storm-Petrel	Bird	Likely	Species or species habitat	Vulnerable					Species Profile and Threat	In feature area
82950	*Sternula nereis nereis*	Australian Fairy Tern	Bird	Likely	Foraging, feeding or	Vulnerable					Species Profile and Threat	In feature area

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Listed Migratory Species

				Presence								
Species ID	**Scientific Name**	**Common Name**	**Class**	**Rank**	**Text**	**Threatened Category**	**Migratory Status**	**Migratory Category**	**Marine Status**	**Cetacean Status**	**Website**	**Buffer Status**
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66491	*Thalassarche chrysostoma*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64470	*Carcharodon carcharias*	White Shark, Great White	Shark	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
83288	*Lamna nasus*	Porbeagle, Mackerel Shark	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
84108	*Carcharhinus longimanus*	Oceanic Whitetip Shark	Shark	May	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
79073	*Isurus oxyrinchus*	Shortfin Mako, Mako	Shark	Likely	Species or species habitat		Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66680	*Rhincodon typus*	Whale Shark	Shark	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species			Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area

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Listed Marine Species

Species ID	Scientific Name	Common Name	Class	Presence		Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
				Rank	Text							
66277	*Stigmatopora nigra*	Widebody Pipefish, Wide-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
847	*Numenius*	Eastern Curlew, Far	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
64457	*Thalassarche eremita*	Chatham Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64456	*Diomedea sanfordi*	Northern Royal Albatross	Bird	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
823	*Stercorarius skua*	Great Skua	Bird	May	Species or species habitat				Listed (as Catharacta skua)		Species Profile and Threat	In feature area
66705	*Hippocampus minotaur*	Bullneck Seahorse	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66491	*Thalassarche chrysostoma*	Grey-headed Albatross	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
874	*Calidris acuminata*	Sharp-tailed Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
59309	*Actitis hypoleucos*	Common Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed		Species Profile and Threat	In feature area
66251	*Lissocampus runa*	Javelin Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
21	*Arctocephalus pusillus*	Australian Fur-seal,	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66276	*Stigmatopora argus*	Spotted Pipefish, Gulf	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66246	*Kaupus costatus*	Deepbody Pipefish, Deep-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66279	*Syngnathoides*	Double-end Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66278	*Stipecampus cristatus*	Ringback Pipefish, Ring-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66275	*Solegnathus spinosissimus*	Spiny Pipehorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
20	*Arctocephalus forsteri*	Long-nosed Fur-seal, New	Mammal	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66274	*Solegnathus robustus*	Robust Pipehorse, Robust	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66248	*Leptoichthys fistularius*	Brushtail Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66472	*Thalassarche melanophris*	Black-browed Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1061	*Macronectes halli*	Northern Giant Petrel	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
1060	*Macronectes giganteus*	Southern Giant-Petrel,	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66242	*Histiogamphelus briggsii*	Crested Pipefish, Briggs'	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1066	*Pachyptila turtur*	Fairy Prion	Bird	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
89221	*Diomedea epomophora*	Southern Royal Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66243	*Histiogamphelus cristatus*	Rhino Pipefish, Macleay's	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66245	*Hypselognathus rostratus*	Knifesnout Pipefish, Knife-	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1765	*Chelonia mydas*	Green Turtle	Reptile	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
1768	*Dermochelys coriacea*	Leatherback Turtle,	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66252	*Maroubra perserrata*	Sawtooth Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1763	*Caretta caretta*	Loggerhead Turtle	Reptile	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species	Listed		Species Profile and Threat	In feature area
66268	*Phyllopteryx taeniolatus*	Common Seadragon,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66265	*Notiocampus ruber*	Red Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66262	*Mitotichthys tuckeri*	Tucker's Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66261	*Mitotichthys semistriatus*	Halfbanded Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66247	*Kimblaeus bassensis*	Trawl Pipefish, Bass Strait	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
1059	*Halobaena caerulea*	Blue Petrel	Bird	May	Species or species habitat	Vulnerable			Listed		Species Profile and Threat	In feature area
82273	*Thalassarche bulleri platei*	Northern Buller's	Bird	May	Species or species habitat	Vulnerable			Listed (as Thalassarche sp.		Species Profile and Threat	In feature area
82270	*Diomedea antipodensis*	Gibson's Albatross	Bird	Likely	Species or species habitat	Vulnerable			Listed (as Diomedea		Species Profile and Threat	In feature area
64462	*Thalassarche steadi*	White-capped Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64464	*Thalassarche carteri*	Indian Yellow-nosed	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64460	*Thalassarche bulleri*	Buller's Albatross, Pacific	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64463	*Thalassarche salvini*	Salvin's Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
82651	*Ardenna grisea*	Sooty Shearwater	Bird	May	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus griseus)		Species Profile and Threat	In feature area
89223	*Diomedea exulans*	Wandering Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
856	*Calidris ferruginea*	Curlew Sandpiper	Bird	May	Species or species habitat	Critically Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
855	*Calidris canutus*	Red Knot, Knot	Bird	May	Species or species habitat	Endangered	Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
66235	*Hippocampus breviceps*	Short-head Seahorse,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66233	*Hippocampus*	Big-belly Seahorse, Eastern	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
82404	*Ardenna carneipes*	Flesh-footed Shearwater,	Bird	Likely	Species or species habitat		Migratory	Migratory Marine Birds	Listed (as Puffinus		Species Profile and Threat	In feature area
858	*Calidris melanotos*	Pectoral Sandpiper	Bird	May	Species or species habitat		Migratory	Migratory Wetlands	Listed - overfly marine		Species Profile and Threat	In feature area
1075	*Phoebetria fusca*	Sooty Albatross	Bird	May	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66282	*Urocampus carinirostris*	Hairy Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
64459	*Thalassarche impavida*	Campbell Albatross,	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
64458	*Diomedea antipodensis*	Antipodean Albatross	Bird	Likely	Species or species habitat	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species Profile and Threat	In feature area
66283	*Vanacampus margaritifer*	Mother-of-pearl Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66227	*Heraldia nocturna*	Upside-down Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66285	*Vanacampus*	Longsnout Pipefish,	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area
66284	*Vanacampus phillipi*	Port Phillip Pipefish	Fish	May	Species or species habitat				Listed		Species Profile and Threat	In feature area

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Whales and Other Cetaceans

Species ID	Scientific Name	Common Name	Class	Presence		Threatened Category	Migratory Status	Migratory Category	Marine Status	Cetacean Status	Website	Buffer Status
				Rank	Text							
39	*Caperea marginata*	Pygmy Right Whale	Mammal	Likely	Foraging, feeding or		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
38	*Megaptera novaeangliae*	Humpback Whale	Mammal	Known	Species or species habitat	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
36	*Balaenoptera musculus*	Blue Whale	Mammal	Likely	Species or species habitat	Endangered	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
33	*Balaenoptera*	Minke Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
37	*Balaenoptera physalus*	Fin Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
68417	*Tursiops truncatus s. str.*	Bottlenose Dolphin	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
35	*Balaenoptera edeni*	Bryde's Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
67812	*Balaenoptera bonaerensis*	Antarctic Minke Whale,	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59	*Physeter macrocephalus*	Sperm Whale	Mammal	May	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
54	*Mesoplodon mirus*	True's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
57	*Kogia breviceps*	Pygmy Sperm Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
70	*Berardius arnuxii*	Arnoux's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
73	*Mesoplodon bowdoini*	Andrew's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
74	*Mesoplodon densirostris*	Blainville's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
76	*Mesoplodon hectori*	Hector's Beaked Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
43	*Lagenorhynchus obscurus*	Dusky Dolphin	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
44	*Lissodelphis peronii*	Southern Right Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
56	*Ziphius cavirostris*	Cuvier's Beaked Whale,	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
40	*Eubalaena australis*	Southern Right Whale	Mammal	Known	Species or species habitat	Endangered	Migratory (as Balaena	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
25556	*Mesoplodon layardii*	Strap-toothed Beaked	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
85043	*Kogia sima*	Dwarf Sperm Whale	Mammal	May	Species or species habitat					Cetacean (as Kogia simus)	Species Profile and Threat	In feature area
34	*Balaenoptera borealis*	Sei Whale	Mammal	Likely	Foraging, feeding or	Vulnerable	Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
48	*Pseudorca crassidens*	False Killer Whale	Mammal	Likely	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
46	*Orcinus orca*	Killer Whale, Orca	Mammal	Likely	Species or species habitat		Migratory	Migratory Marine Species		Cetacean	Species Profile and Threat	In feature area
59282	*Globicephala melas*	Long-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
64	*Grampus griseus*	Risso's Dolphin, Grampus	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
62	*Globicephala*	Short-finned Pilot Whale	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area
60	*Delphinus delphis*	Common Dolphin, Short-	Mammal	May	Species or species habitat					Cetacean	Species Profile and Threat	In feature area

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EPBC Act Referrals

Reference Number	Title of referral	Jurisdiction	Industry Type	Stage	Stage Description	Referral Outcome	Website	Buffer Status
2017/7996	INDIGO Marine Cable	CM	Telecommunications	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2004/1876	2D seismic Survey in	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2003/1282	2004/2005 drilling	VIC	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/289	Offshore Petroleum	CM	Exploration (mineral, oil	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/525	Seismic survey, Gippsland	VIC	Mining	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/775	Non-exclusive 3-D Marine	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2002/864	Tuskfish 3D Seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2010/5288	Southern Flanks 2D	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2001/140	Northern Fields 3D Seismic	CM	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2017/8127	INDIGO Central Submarine	NSW	Telecommunications	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2007/3915	West Triton Drilling	VIC	Energy Generation and	Completed	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area
2006/3146	Apache 3D seismic	VIC	Exploration (mineral, oil	Post-Approval	Referral Decision Made	Not Controlled Action	EPBC Referral Detail	In feature area

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Biologically Important Areas

Species ID	Scientific Name	Common Name	Species Group	Behaviour	Presence	Website	Buffer Status
82652	Ardenna tenuirostris	Short-tailed Shearwater	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1073	Diomedea exulans (sensu	Wandering Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
1018	Pelecanoides urinatrix	Common Diving-petrel	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64460	Thalassarche bulleri	Bullers Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82345	Thalassarche cauta cauta	Shy Albatross	Seabirds	Foraging likely	Likely to occur	Species Profile and Threat	In feature area
85249	Thalassarche	Indian Yellow-nosed	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
66472	Thalassarche melanophris	Black-browed Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
82449	Thalassarche melanophris	Campbell Albatross	Seabirds	Foraging	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Known to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Distribution (low density)	Likely to occur	Species Profile and Threat	In feature area
64470	Carcharodon carcharias	White Shark	Sharks	Known distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Distribution	Known to occur	Species Profile and Threat	In feature area
81317	Balaenoptera musculus	Pygmy Blue Whale	Whales	Foraging	Likely to be present	Species Profile and Threat	In feature area
40	Eubalaena australis	Southern Right Whale	Whales	Known core range	Known to occur	Species Profile and Threat	In feature area

Back to Summary

Caveat

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. The report provides the mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species, listed threatened ecological communities and other information could be useful as an indicator of potential habitat value. The mapped locations have been collated from a range of data sources at various resolutions as acknowledged at the end of this report.

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

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery, thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps, thematic spatial data and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, 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 very little information is available for species or a large number of maps are required in a short time-frame, maps are derived or supplemented either with 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

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

- threatened species listed as extinct or considered vagrants
- some recently listed species and ecological communities – as there may be a delay of several days in the mapping being made available for reporting after a listing event
- some terrestrial species that overfly the Commonwealth marine area
- some listed migratory and listed marine species, which are not listed as threatened species
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, may only have been mapped for recorded breeding sites
- seals which may have only been mapped for breeding sites near the Australian continent

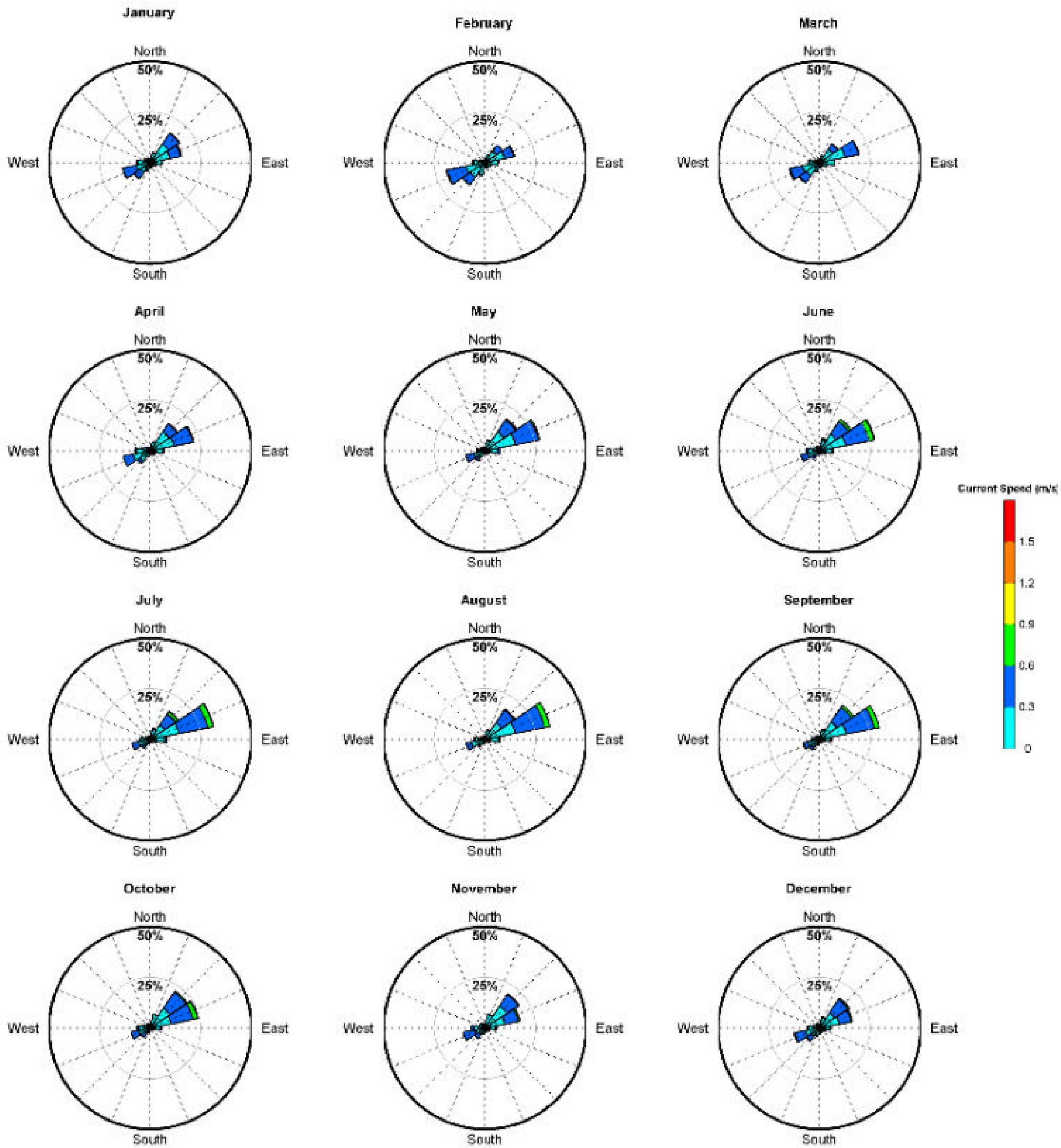
The breeding sites may be important for the protection of the Commonwealth Marine environment.

Nationally Important Wetlands are not a Matter of National Environmental Significance and do not have protection under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). They may however provide habitat and support other listed species that are protected under the EPBC Act.

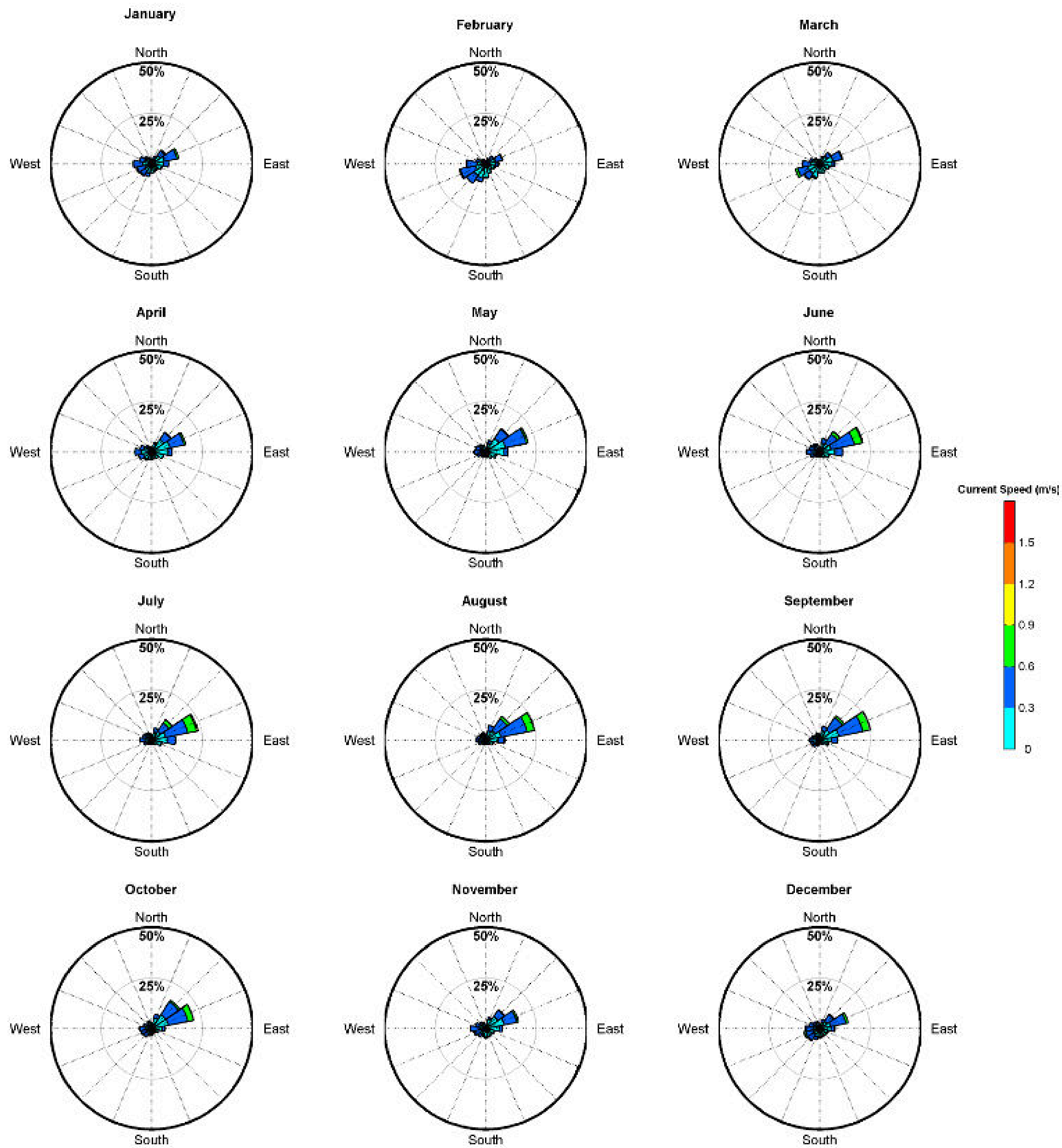
Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Appendix D2 Current Wind Roses

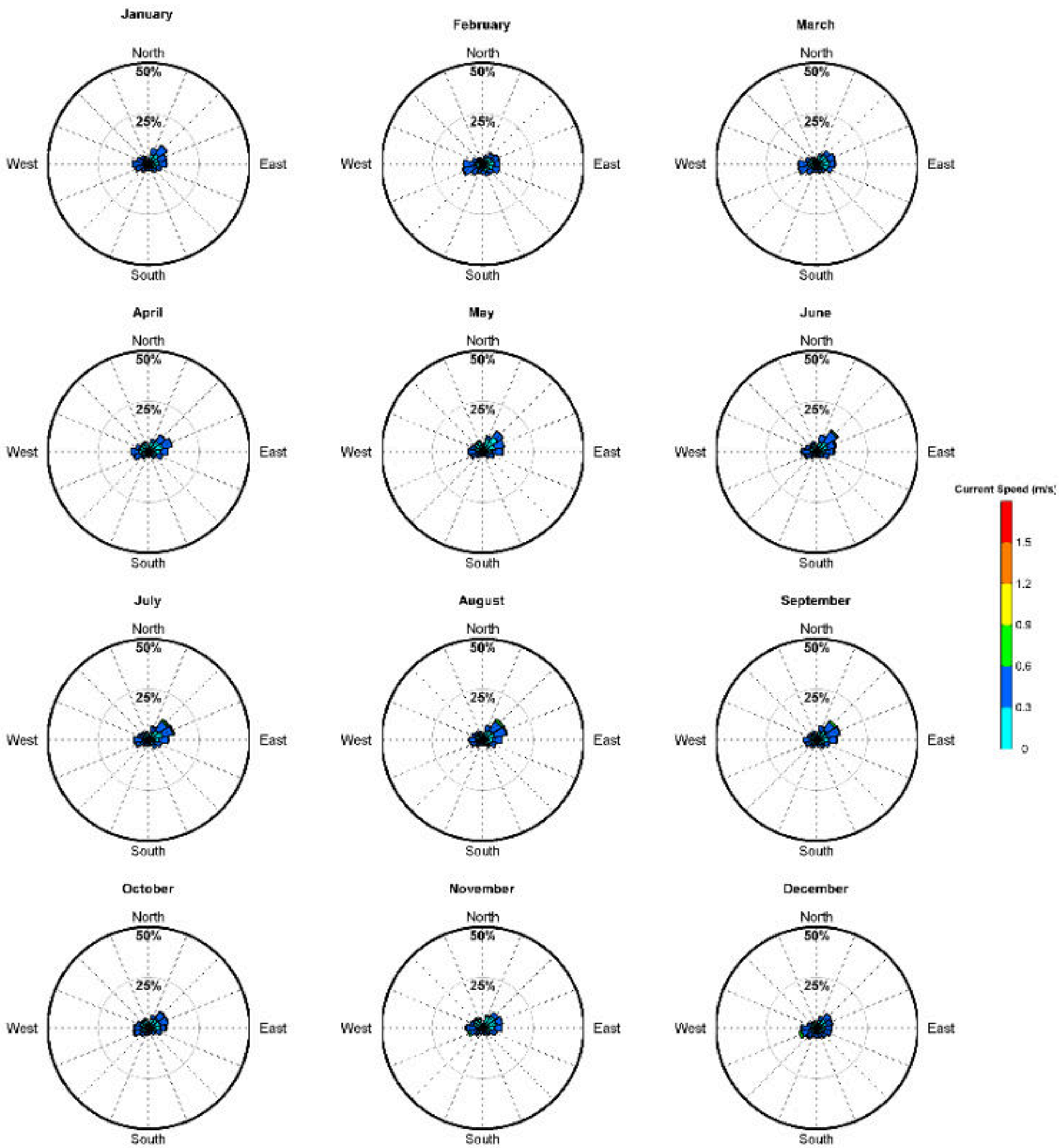
SNA – Monthly average currents (2010-2014)



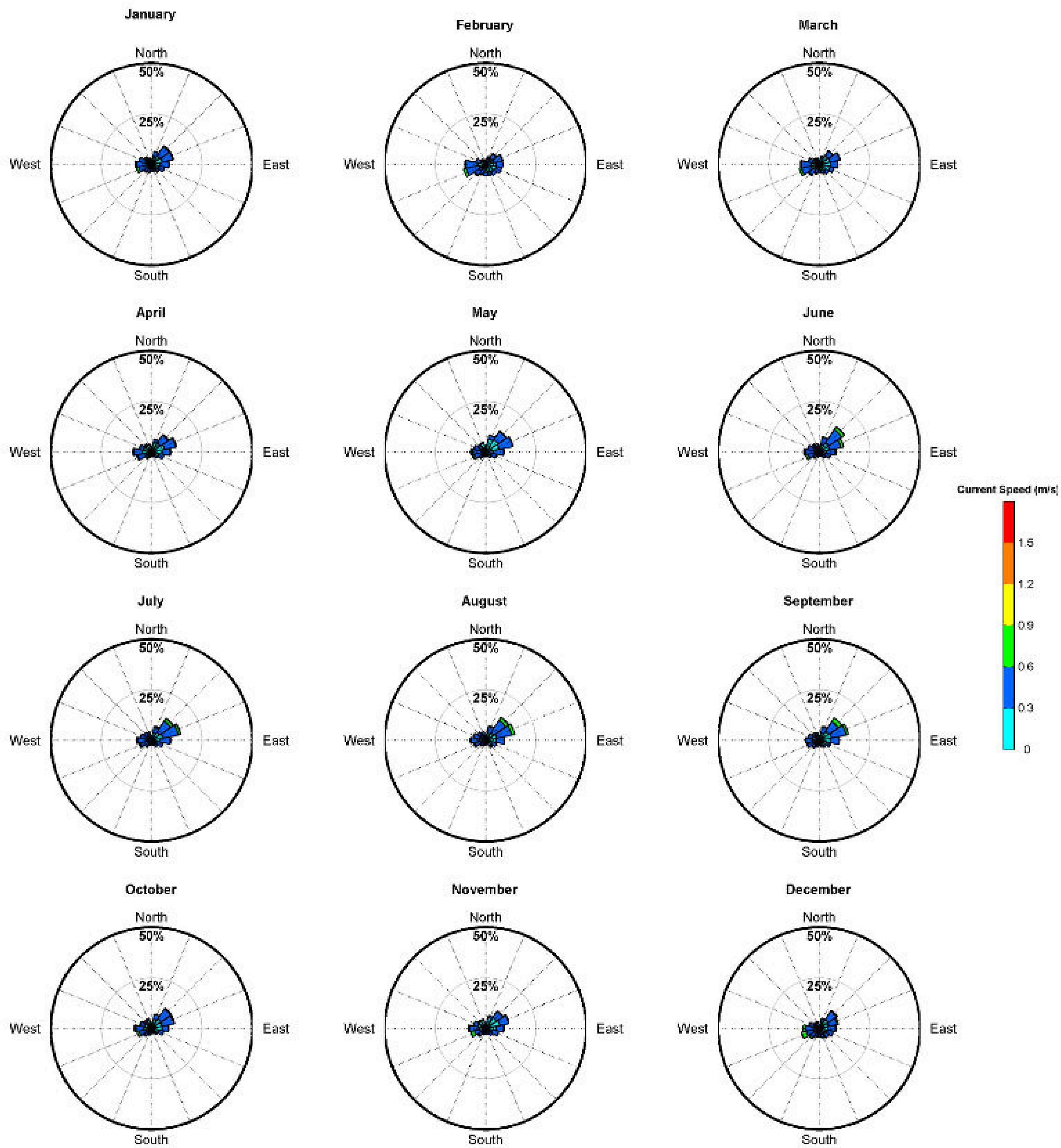
TNA – Monthly average currents (2010-2014)



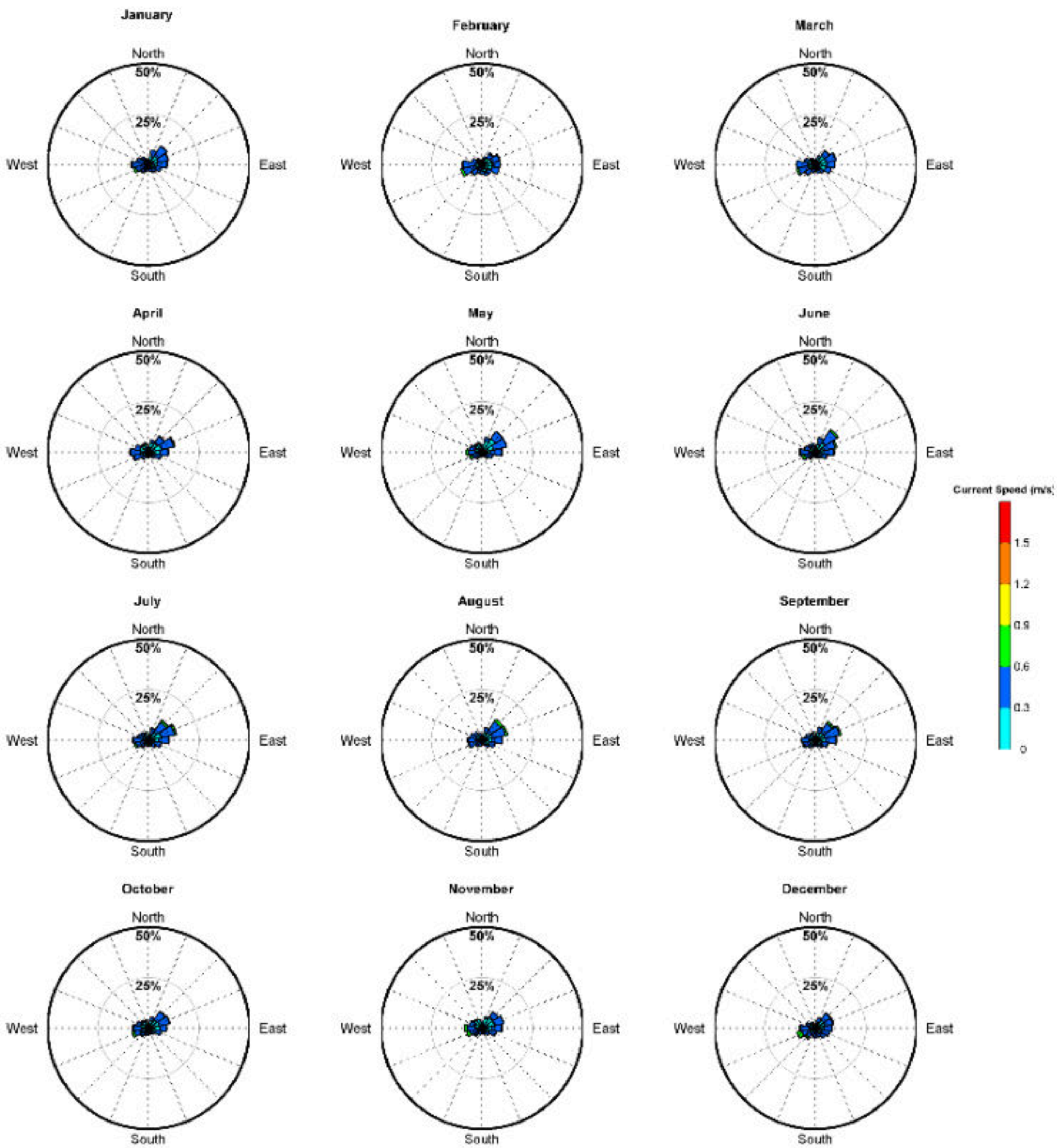
FTA – Monthly average currents (2010-2014)



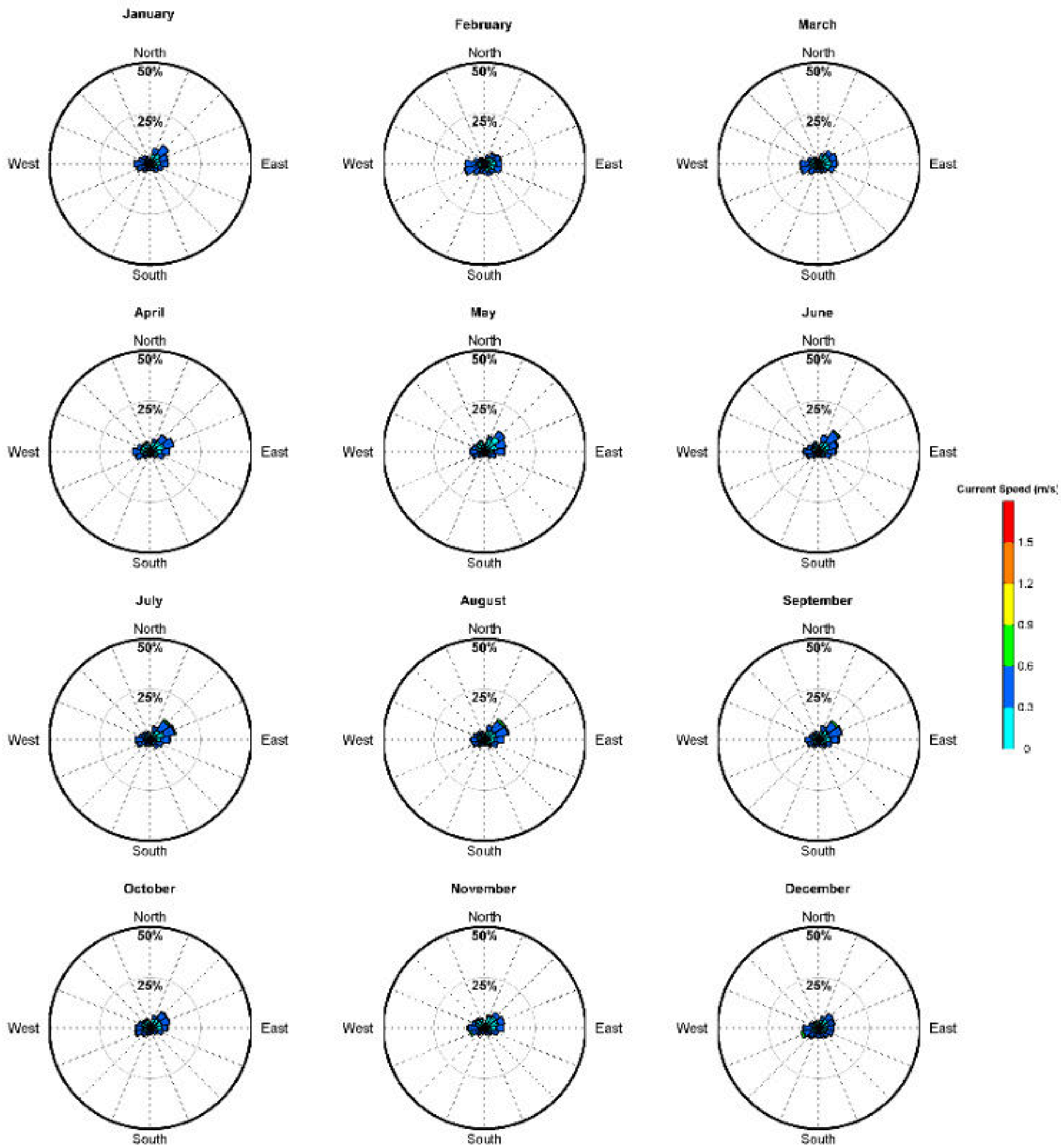
HLA – Monthly average currents (2010-2014)



CBA – Monthly average currents (2010-2014)



MKA – Monthly average currents (2010-2014)



Appendix E Environmental Survey 1 (Summer) remotely operated vehicle transect fish observations

Genus species	Common name	Feeding guild	Total	CBA	FLA	HLA	KFA	WTA	Reference site	South East reef	FLA benthic surrounds	HLA benthic surrounds	KFA benthic surrounds	WTA benthic surrounds
Engraulis australis	Australian anchovy	Zooplanktivore	52999	303	10848	5128	35850	120	0	0	0	750	0	0
Trachurus spp.	Scad	Zooplanktivore	32070	1023	10024	14288	962	5294	30	252	56	140	1	0
Caesioperca lepidoptera	Butterfly perch	Zooplanktivore	16464	1429	2755	8327	2042	827	0	724	8	264	62	26
Scorpis lineolata	Silver sweep	Piscivore	3613	252	1626	1397	315	18	0	0	0	5	0	0
Scorpaena spp.	Scorpionfish	Invertebrate carnivore	1833	726	228	310	58	44	1	3	46	248	49	120
Nemadactylus macropterus	Jackass morwong	Invertebrate carnivore	1159	18	98	475	514	25	0	16	3	10	0	0
Helicolenus percoides	Reef ocean perch	Generalist carnivore	957	105	158	221	24	11	6	151	73	9	8	191
Callanthias australis	Splendid perch	Zooplanktivore	631	11	79	408	132	1	0	0	0	0	0	0
Parapercis allporti	Barred grubfish	Invertebrate carnivore	432	0	0	0	0	0	75	170	15	67	98	7
Foetorepus calauropomus	Common stinkfish	Invertebrate carnivore	397	0	0	0	0	3	0	3	211	76	21	83
Scorpis aequipinnis	Sea sweep	Algae/invertebrate consumer	386	12	15	129	135	95	0	0	0	0	0	0
Pseudocaranx spp.	Skipjack trevally	Invertebrate carnivore	381	82	123	24	132	20	0	0	0	0	0	0
Triglidae spp.	Unknown gurnard	Generalist carnivore	368	0	0	0	0	0	23	69	109	16	67	84
Pseudophycis spp.	Red cod	Invertebrate carnivore	159	4	4	7	8	1	1	0	34	2	98	0
Parequula melbournensis	Silverbelly	Invertebrate carnivore	143	0	0	84	0	0	11	6	0	0	0	42
Caesioperca spp.	Perch	Zooplanktivore	108	0	0	0	0	0	0	100	0	0	8	0
Paratrachichthys macleayi	Sandpaper fish	Invertebrate carnivore	70	14	5	7	44	0	0	0	0	0	0	0
Chromis hypsilepis	Onespot puller	Algae/invertebrate consumer	66	2	19	45	0	0	0	0	0	0	0	0
Urolophus spp.	Stingaree	Invertebrate carnivore	61	0	0	0	0	0	13	37	5	0	4	2
Centroberyx spp.	Redfish	Generalist carnivore	51	1	0	22	27	1	0	0	0	0	0	0
Neosebastes spp.	Gurnard perch	Generalist carnivore	46	0	0	0	0	0	13	20	0	3	2	8

Genus species	Common name	Feeding guild	Total	CBA	FLA	HLA	KFA	WTA	Reference site	South East reef	FLA benthic surrounds	HLA benthic surrounds	KFA benthic surrounds	WTA benthic surrounds
Meuschenia scaber	Velvet leatherjacket	Algae/invertebrate consumer	40	2	0	1	1	0	0	34	0	2	0	0
Monacanthidae spp.	Unknown leatherjacket	Invertebrate carnivore	40	0	0	0	0	0	0	30	0	0	5	5
Pseudolabrus rubicundus	Rosy wrasse	Invertebrate carnivore	39	2	3	4	1	25	0	4	0	0	0	0
Parapercis binivirgata	Redbanded grubfish	Invertebrate carnivore	18	0	0	0	0	0	0	18	0	0	0	0
Narcinops tasmaniensis	Tasmanian numbfish	Invertebrate carnivore	16	0	0	0	0	0	12	4	0	0	0	0
Hypoplectrodes maccullochi	Halfbanded seaperch	Generalist carnivore	14	3	2	6	1	2	0	0	0	0	0	0
Pentaceropsis recurvirostris	Longsnout boarfish	Generalist carnivore	14	0	0	0	0	13	0	0	0	0	0	1
Urolophus cruciatus	Banded stingaree	Invertebrate carnivore	14	0	0	0	0	0	0	10	0	0	4	0
Sillago spp.	Whiting	Invertebrate carnivore	13	0	0	0	13	0	0	0	0	0	0	0
Platycephalidae spp.	Flathead	Generalist carnivore	12	0	0	0	0	0	1	2	8	0	0	1
Eubalichthys gunnii	Gunn's leatherjacket	Invertebrate carnivore	10	0	0	8	0	1	0	0	0	0	0	1
Callanthias allporti	Rosy perch	Zooplanktivore	9	0	0	0	0	0	0	1	0	0	3	5
Macroramphosus scolopax	Common bellowsfish	Generalist carnivore	9	0	0	3	0	0	0	0	3	0	2	1
Thyrsites atun	Barracouta	Piscivore	9	0	0	0	0	1	0	0	5	0	0	3
Cheilodactylus spectabilis	Banded morwong	Invertebrate carnivore	7	1	2	2	1	1	0	0	0	0	0	0
Enoplosus armatus	Old wife	Invertebrate carnivore	7	0	0	3	4	0	0	0	0	0	0	0
Parma microlepis	White-ear scalyfin	Algae/invertebrate consumer	7	1	1	4	1	0	0	0	0	0	0	0
Cephaloscyllium laticeps	Draughtboard shark	Generalist carnivore	6	0	0	2	3	1	0	0	0	0	0	0
Cheilodactylus nigripes	Magpie perch	Invertebrate carnivore	5	0	1	1	3	0	0	0	0	0	0	0
Notolabrus tetricus	Bluethroat wrasse	Invertebrate carnivore	5	0	0	0	3	2	0	0	0	0	0	0
Scorpis spp.	Sweep	Invertebrate carnivore	5	0	0	0	5	0	0	0	0	0	0	0

Genus species	Common name	Feeding guild	Total	CBA	FLA	HLA	KFA	WTA	Reference site	South East reef	FLA benthic surrounds	HLA benthic surrounds	KFA benthic surrounds	WTA benthic surrounds
Caesioperca rasor	Barber perch	Zooplanktivore	4	0	0	0	0	0	0	4	0	0	0	0
Bathytoshia brevicaudata	Smooth stingray	Generalist carnivore	3	1	1	1	0	0	0	0	0	0	0	0
Parapercis spp.	Grubfish	Invertebrate carnivore	3	0	0	0	0	0	1	0	0	0	2	0
Tetraodontidae spp.	Pufferfish	N/A	3	0	0	0	0	0	0	3	0	0	0	0
Upeneichthys vlamingii	Bluespotted goatfish	Invertebrate carnivore	3	0	0	0	0	0	0	3	0	0	0	0
Latris lineata	Striped trumpeter	Generalist carnivore	2	0	0	0	2	0	0	0	0	0	0	0
Lepidotrigla spp.	Gurnard	Invertebrate carnivore	2	0	0	0	0	0	0	0	0	2	0	0
Trygonoptera spp.	Stingaree	Generalist carnivore	2	0	0	0	0	0	0	2	0	0	0	0
Trygonorrhina dumerilii	Southern fiddler ray	Generalist carnivore	2	0	0	0	0	0	0	2	0	0	0	0
Acanthaluteres spilomelanurus	Bridled leatherjacket	Invertebrate carnivore	1	0	0	0	0	0	0	0	0	0	0	1
Atypichthys strigatus	Mado	Invertebrate carnivore	1	0	0	1	0	0	0	0	0	0	0	0
Carcharodon carcharias	White shark	Generalist carnivore	1	0	0	0	0	0	0	0	0	0	0	1
Dentiraja confusa	Australian longnose skate	Generalist carnivore	1	0	0	0	0	0	1	0	0	0	0	0
Gymnothorax prasinus	Green moray	Generalist carnivore	1	1	0	0	0	0	0	0	0	0	0	0
Labridae spp.	Unknown wrasse	N/A	1	0	0	0	1	0	0	0	0	0	0	0
Lepidoperca pulchella	Eastern orange perch	Generalist carnivore	1	0	0	1	0	0	0	0	0	0	0	0
Monacanthus chinensis	Fanbelly leatherjacket	Algae/invertebrate consumer	1	0	0	0	0	1	0	0	0	0	0	0
Nemadactylus douglasii	Grey morwong	Invertebrate carnivore	1	0	0	0	1	0	0	0	0	0	0	0
Urolophidae spp.	Unknown stingaree	Generalist carnivore	1	0	0	0	0	0	0	1	0	0	0	0

Appendix F1 Environmental Survey 1 (Summer) sediment screening levels

Levels of potential concern against which analytical results from sediment samples in the Gippsland Basin were compared are shown in Table F-1. The regulatory screening levels are based on ANZECC water quality guidelines or similar guideline values and are for the protection of environmental health. The literature screening values are for bioaccumulation or community change endpoints identified in the literature. All values are in milligrams per kilogram dry weight, except NORMs. Shaded grey boxes indicate that bioaccumulation will not be evaluated separately from other environmental impacts for these contaminants (Hook S. E., et al., 2021).

Table F-1 Summary Table of Levels of Potential Concern against which analytical results from sediment samples in the Gippsland Basin were compared.

Contaminant	Regulatory screening level mg/kg dry weight	Literature screening level mg/kg dry weight (except for NORM[c])
Oil constituents		
Total polycyclic aromatic hydrocarbons (TPAH)	4	0.1[a]
Total recoverable hydrocarbons (TRH)	280	
Acenaphthene	0.016	
Acenaphthalene	0.044	
Anthracene	0.085	
Fluorene	0.019	
Naphthalene	0.16	
Phenanthrene	0.24	
Benzo(a)anthracene	0.261	
Benzo(a)pyrene	0.43	
Dibenzo (a,h) anthracene	0.063	
Chrysene	0.384	
Fluoranthene	0.6	
Pyrene	0.665	

Contaminant	Regulatory screening level mg/kg dry weight	Literature screening level mg/kg dry weight (except for NORM[c])
Metals and metalloids		
Aluminum	26,625	
Antimony	2	
Arsenic	20*	
Barium	200	
Cadmium	1.5	
Chromium	80	
Cobalt	10	
Copper	34	
Iron	73,700	
Lead	30	4[b]
Manganese	260	
Mercury	0.15	0.05[b]
Nickel	21	
Selenium	1	
Silver	1	
Vanadium	57	
Zinc	200	
NORMs (gross Alpha and Beta emitters)		1000 Bq/kg DW[c]

* Denotes low confidence in using a screening value approach with this contaminant.

a. Lower screening level is based on the potential for adverse outcomes measured as changes in benthic community structure.

b. Lower screening level is based on the potential for bioaccumulation and contamination of seafood resources.

c. Value was chosen based on the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) regulatory exemption limit for individual NORM radionuclides, as discussed in Hook S. E., et al. (2021). It is also twice the LOR. Units are Bq/kg dry weight (DW)

Appendix F2 Environmental Survey 1 (Summer) sediment results - raw data

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	BenzoghiPe	DibenzahA	Indeno1.2.	Coronene	PAHsum
REF1_1	0.15	2.5	2.5	2	2	2	2	2	2	2	REF1_1	2	2	2	2	2	2	2	REF1_1	2	2	2	2.5	2
REF1_2	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	REF1_2	NA	NA	NA	NA	NA	NA	NA	REF1_2	NA	NA	NA	NA	NA
REF1_3	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	REF1_3	NA	NA	NA	NA	NA	NA	NA	REF1_3	NA	NA	NA	NA	NA
REF2_1	0.3	2.5	2.5	2	2	2	2	2	2	2	REF2_1	2	2	2	2	2	2	2	REF2_1	2	2	2	2.5	2
REF2_2	0.35	2.5	2.5	2	2	2	2	2	2	2	REF2_2	2	2	2	2	2	2	2	REF2_2	2	2	2	2.5	2
REF2_3	0.34	2.5	2.5	2	2	2	2	2	2	2	REF2_3	2	2	2	2	2	2	2	REF2_3	2	2	2	2.5	2
REF3_1	0.26	2.5	2.5	2	2	2	2	2	2	2	REF3_1	2	2	2	2	2	2	2	REF3_1	2	2	2	2.5	2
REF3_2	0.24	2.5	2.5	2	2	2	2	2	2	2	REF3_2	2	2	2	2	2	2	2	REF3_2	2	2	2	2.5	2
REF3_3	0.23	2.5	2.5	2	2	2	2	2	2	2	REF3_3	2	2	2	2	2	2	2	REF3_3	2	2	2	2.5	2
REF4_1	0.17	2.5	2.5	2	2	2	2	2	2	2	REF4_1	2	2	2	2	2	2	2	REF4_1	2	2	2	2.5	2
REF4_2	0.18	2.5	2.5	2	2	2	2	2	2	2	REF4_2	2	2	2	2	2	2	2	REF4_2	2	2	2	2.5	2
REF4_3	0.18	2.5	2.5	2	2	2	2	2	2	2	REF4_3	2	2	2	2	2	2	2	REF4_3	2	2	2	2.5	2
REF5_1	0.21	2.5	2.5	2	2	2	2	2	2	2	REF5_1	2	2	2	2	2	2	2	REF5_1	2	2	2	2.5	2
REF5_2	0.24	2.5	2.5	2	2	2	2	2	2	2	REF5_2	2	2	2	2	2	2	2	REF5_2	2	2	2	2.5	2
REF5_3	0.2	2.5	2.5	2	2	2	2	2	2	2	REF5_3	2	2	2	2	2	2	2	REF5_3	2	2	2	2.5	2
REF6_1	0.34	2.5	2.5	2	2	2	2	2	2	2	REF6_1	2	2	2	2	2	2	2	REF6_1	2	2	2	2.5	2
REF6_2	0.37	2.5	2.5	2	2	2	2	2	2	2	REF6_2	2	2	2	2	2	2	2	REF6_2	2	2	2	2.5	2
REF6_3	0.41	2.5	2.5	2	2	2	2	2	2	2	REF6_3	2	2	2	2	2	2	2	REF6_3	2	2	2	2.5	2
REF7_1	0.24	2.5	2.5	2	2	2	2	2	2	2	REF7_1	2	2	2	2	2	2	2	REF7_1	2	2	2	2.5	2
REF7_2	0.23	2.5	2.5	2	2	2	2	2	2	2	REF7_2	2	2	2	2	2	2	2	REF7_2	2	2	2	2.5	2
REF7_3	0.23	2.5	2.5	2	2	2	2	2	2	2	REF7_3	2	2	2	2	2	2	2	REF7_3	2	2	2	2.5	2
REF8_1	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	REF8_1	NA	NA	NA	NA	NA	NA	NA	REF8_1	NA	NA	NA	NA	NA
REF8_2	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	REF8_2	NA	NA	NA	NA	NA	NA	NA	REF8_2	NA	NA	NA	NA	NA
REF8_3	0.1	2.5	2.5	2	2	2	2	2	2	2	REF8_3	2	2	2	2	2	2	2	REF8_3	2	2	2	2.5	2
REF9_1	0.35	2.5	2.5	2	2	2	2	2	2	2	REF9_1	2	2	2	2	2	2	2	REF9_1	2	2	2	2.5	2
REF9_2	0.35	2.5	2.5	2	2	2	2	2	2	2	REF9_2	2	2	2	2	2	2	2	REF9_2	2	2	2	2.5	2
REF9_3	0.33	2.5	2.5	2	2	2	2	2	2	2	REF9_3	2	2	2	2	2	2	2	REF9_3	2	2	2	2.5	2
REF10_1	0.23	2.5	2.5	2	2	2	2	2	2	2	REF10_1	2	2	2	2	2	2	2	REF10_1	2	2	2	2.5	2
REF10_2	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	REF10_2	NA	NA	NA	NA	NA	NA	NA	REF10_2	NA	NA	NA	NA	NA
REF10_3	0.21	2.5	2.5	2	2	2	2	2	2	2	REF10_3	2	2	2	2	2	2	2	REF10_3	2	2	2	2.5	2
REF11_1	0.25	2.5	2.5	2	2	2	2	2	2	2	REF11_1	2	2	2	2	2	2	2	REF11_1	2	2	2	2.5	2
REF11_2	0.46	2.5	2.5	2	2	2	2	2	2	2	REF11_2	2	2	2	2	2	2	2	REF11_2	2	2	2	2.5	2
REF11_3	0.27	2.5	2.5	2	2	2	2	2	2	2	REF11_3	2	2	2	2	2	2	2	REF11_3	2	2	2	2.5	2
REF12_1	0.28	2.5	2.5	2	2	2	2	2	2	2	REF12_1	2	2	2	2	2	2	2	REF12_1	2	2	2	2.5	2
REF12_2	0.2	2.5	2.5	2	2	2	2	2	2	2	REF12_2	2	2	2	2	2	2	2	REF12_2	2	2	2	2.5	2
SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	BenzoghiPe	DibenzahA	Indeno1.2.	Coronene	PAHsum
REF12_3	0.22	2.5	2.5	2	2	2	2	2	2	2	REF12_3	2	2	2	2	2	2	2	REF12_3	2	2	2	2.5	2
REF13_1	0.21	NA	NA	NA	NA	NA	NA	NA	NA	NA	REF13_1	NA	NA	NA	NA	NA	NA	NA	REF13_1	NA	NA	NA	NA	NA
REF13_2	0.28	2.5	2.5	2	2	2	2	2	2	2	REF13_2	2	2	2	2	2	2	2	REF13_2	2	2	2	2.5	2
REF13_3	0.41	NA	NA	NA	NA	NA	NA	NA	NA	NA	REF13_3	NA	NA	NA	NA	NA	NA	NA	REF13_3	NA	NA	NA	NA	NA
REF14_1	0.4	2.5	2.5	2	2	2	2	2	2	2	REF14_1	2	2	2	2	2	2	2	REF14_1	2	2	2	2.5	2
REF14_2	0.34	2.5	2.5	2	2	2	2	2	2	2	REF14_2	2	2	2	2	2	2	2	REF14_2	2	2	2	2.5	2
REF14_3	0.31	5	2.5	2	2	2	2	2	2	2	REF14_3	2	2	2	2	2	2	2	REF14_3	2	2	2	2.5	5
REF15_1	0.21	2.5	2.5	2	2	2	2	2	2	2	REF15_1	2	2	2	2	2	2	2	REF15_1	2	2	2	2.5	2
REF15_2	0.19	2.5	2.5	2	2	2	2	2	2	2	REF15_2	2	2	2	2	2	2	2	REF15_2	2	2	2	2.5	2
REF15_3	0.18	2.5	2.5	2	2	2	2	2	2	2	REF15_3	2	2	2	2	2	2	2	REF15_3	2	2	2	2.5	2
REF16_1	0.25	2.5	2.5	2	2	2	2	2	2	2	REF16_1	2	2	2	2	2	2	2	REF16_1	2	2	2	2.5	2
REF16_2	0.27	2.5	2.5	2	2	2	2	2	2	2	REF16_2	2	2	2	2	2	2	2	REF16_2	2	2	2	2.5	2
REF16_3	0.36	2.5	2.5	2	2	2	2	2	2	2	REF16_3	2	2	2	2	2	2	2	REF16_3	2	2	2	2.5	2
REF17_1	0.26	2.5	2.5	2	2	2	2	2	2	2	REF17_1	2	2	2	2	2	2	2	REF17_1	2	2	2	2.5	2
REF17_2	0.32	2.5	2.5	2	2	2	2	2	2	2	REF17_2	2	2	2	2	2	2	2	REF17_2	2	2	2	2.5	2
REF17_3	0.27	2.5	2.5	2	2	2	2	2	2	2	REF17_3	2	2	2	2	2	2	2	REF17_3	2	2	2	2.5	2
REF18_1	0.36	2.5	2.5	2	2	2	2	2	2	2	REF18_1	2	2	2	2	2	2	2	REF18_1	2	2	2	2.5	2
REF18_2	0.26	2.5	2.5	2	2	2	2	2	2	2	REF18_2	2	2	2	2	2	2	2	REF18_2	2	2	2	2.5	2
REF18_3	0.3	2.5	2.5	2	2	2	2	2	2	2	REF18_3	2	2	2	2	2	2	2	REF18_3	2	2	2	2.5	2
REF_T1A	0.2	2.5	2.5	2	2	2	2	2	2	2	REF_T1A	2	2	2	2	2	2	2	REF_T1A	2	2	2	2.5	2
REF_T1B	0.21	2.5	2.5	2	2	2	2	2	2	2	REF_T1B	2	2	2	2	2	2	2	REF_T1B	2	2	2	2.5	2
REF_T2A	0.22	2.5	2.5	2	2	2	2	2	2	2	REF_T2A	2	2	2	2	2	2	2	REF_T2A	2	2	2	2.5	2

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	BenzoghiPe	DibenzahA	Indeno1.2.	Coronene	PAHsum
REF_T2B	0.17	2.5	2.5	2	2	2	2	2	2	2	REF_T2B	2	2	2	2	2	2	2	REF_T2B	2	2	2	2.5	2
REF_T3A	0.37	2.5	2.5	2	2	2	2	2	2	2	REF_T3A	2	2	2	2	2	2	2	REF_T3A	2	2	2	2.5	2
REF_T3B	0.33	2.5	2.5	2	2	2	2	2	2	2	REF_T3B	2	2	2	2	2	2	2	REF_T3B	2	2	2	2.5	2
REF_T4A	0.12	2.5	2.5	2	2	2	2	2	2	2	REF_T4A	2	2	2	2	2	2	2	REF_T4A	2	2	2	2.5	2
REF_T4B	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	REF_T4B	NA	NA	NA	NA	NA	NA	NA	REF_T4B	NA	NA	NA	NA	NA
REF_T5A	0.12	2.5	2.5	2	2	2	2	2	2	2	REF_T5A	2	2	2	2	2	2	2	REF_T5A	2	2	2	2.5	2
REF_T5B	0.12	2.5	2.5	2	2	2	2	2	2	2	REF_T5B	2	2	2	2	2	2	2	REF_T5B	2	2	2	2.5	2

SampleID_E	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum
REF1_1	0.15	16.66667	16.66667	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	13.33333	16.66667	13.33333
REF1_2	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
REF1_3	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
REF2_1	0.3	8.333333	8.333333	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	8.333333	6.666667
REF2_2	0.35	7.142857	7.142857	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	7.142857	5.714286
REF2_3	0.34	7.352941	7.352941	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	7.352941	5.882353
REF3_1	0.26	9.615385	9.615385	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	9.615385	7.692308
REF3_2	0.24	10.41667	10.41667	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	10.41667	8.333333
REF3_3	0.23	10.86957	10.86957	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	10.86957	8.695652
REF4_1	0.17	14.70588	14.70588	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	14.70588	11.76471
REF4_2	0.18	13.88889	13.88889	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	13.88889	11.11111
REF4_3	0.18	13.88889	13.88889	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	13.88889	11.11111
REF5_1	0.21	11.90476	11.90476	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	11.90476	9.52381
REF5_2	0.24	10.41667	10.41667	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	10.41667	8.333333
REF5_3	0.2	12.5	12.5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	12.5	10
REF6_1	0.34	7.352941	7.352941	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	7.352941	5.882353
REF6_2	0.37	6.756757	6.756757	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	6.756757	5.405405
REF6_3	0.41	6.097561	6.097561	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	4.878049	6.097561	4.878049
REF7_1	0.24	10.41667	10.41667	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	8.333333	10.41667	8.333333
REF7_2	0.23	10.86957	10.86957	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	10.86957	8.695652
REF7_3	0.23	10.86957	10.86957	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	10.86957	8.695652
REF8_1	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
REF8_2	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
REF8_3	0.1	25	25	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	25	20
REF9_1	0.35	7.142857	7.142857	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	7.142857	5.714286
REF9_2	0.35	7.142857	7.142857	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	5.714286	7.142857	5.714286
REF9_3	0.33	7.575758	7.575758	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	7.575758	6.060606
REF10_1	0.23	10.86957	10.86957	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	8.695652	10.86957	8.695652
REF10_2	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
REF10_3	0.21	11.90476	11.90476	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	11.90476	9.52381
REF11_1	0.25	10	10	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	10	8
REF11_2	0.46	5.434783	5.434783	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	4.347826	5.434783	4.347826
REF11_3	0.27	9.259259	9.259259	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	9.259259	7.407407
REF12_1	0.28	8.928571	8.928571	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	8.928571	7.142857
REF12_2	0.2	12.5	12.5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	12.5	10
REF12_3	0.22	11.36364	11.36364	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	11.36364	9.090909
REF13_1	0.21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
REF13_2	0.28	8.928571	8.928571	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	7.142857	8.928571	7.142857
REF13_3	0.41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
REF14_1	0.4	6.25	6.25	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6.25	5
REF14_2	0.34	7.352941	7.352941	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	5.882353	7.352941	5.882353
REF14_3	0.31	16.12903	8.064516	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	6.451613	8.064516	16.12903
REF15_1	0.21	11.90476	11.90476	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	11.90476	9.52381
REF15_2	0.19	13.15789	13.15789	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	10.52632	13.15789	10.52632
REF15_3	0.18	13.88889	13.88889	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	11.11111	13.88889	11.11111
REF16_1	0.25	10	10	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	10	8
REF16_2	0.27	9.259259	9.259259	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	9.259259	7.407407
REF16_3	0.36	6.944444	6.944444	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	6.944444	5.555556
REF17_1	0.26	9.615385	9.615385	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	9.615385	7.692308
REF17_2	0.32	7.8125	7.8125	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	7.8125	6.25
REF17_3	0.27	9.259259	9.259259	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	7.407407	9.259259	7.407407
REF18_1	0.36	6.944444	6.944444	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	5.555556	6.944444	5.555556
REF18_2	0.26	9.615385	9.615385	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	7.692308	9.615385	7.692308
REF18_3	0.3	8.333333	8.333333	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	6.666667	8.333333	6.666667

SampleID_ES	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum
REF_T1A	0.2	12.5	12.5	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	12.5	10
REF_T1B	0.21	11.90476	11.90476	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	9.52381	11.90476	9.52381
REF_T2A	0.22	11.36364	11.36364	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	9.090909	11.36364	9.090909
REF_T2B	0.17	14.70588	14.70588	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	11.76471	14.70588	11.76471
REF_T3A	0.37	6.756757	6.756757	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	5.405405	6.756757	5.405405
REF_T3B	0.33	7.575758	7.575758	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	6.060606	7.575758	6.060606
REF_T4A	0.12	20.83333	20.83333	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	20.83333	16.66667
REF_T4B	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
REF_T5A	0.12	20.83333	20.83333	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	20.83333	16.66667
REF_T5B	0.12	20.83333	20.83333	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	16.66667	20.83333	16.66667

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	SampleID_	Lead	Manganese	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	Methyl me	GrossAlpha	GrossBeta
REF1_1	890	5400	5	0.25	19	0.05	13.7	0.5	0.25	REF1_1	1.5	36	1.6	0.1	0.1	26.1	2.6	0.005	NA	250	250
REF1_2	700	5310	5	0.5	20.2	0.05	14.3	0.5	0.25	REF1_2	1.4	39	1.3	0.1	0.05	25.6	2.1	0.005	NA	250	250
REF1_3	800	5230	5	0.25	19	0.05	14.2	0.5	0.25	REF1_3	1.5	33	1.4	0.1	0.05	25	2.4	0.005	NA	250	250
REF2_1	670	1400	5	0.25	2.87	0.05	4.3	0.5	0.25	REF2_1	1.2	18	1.8	0.2	0.05	5.4	2.3	0.005	NA	250	250
REF2_2	1090	1760	10	0.25	3.3	0.05	4.2	0.5	0.25	REF2_2	1.2	20	1.6	0.3	0.05	6.2	2.6	0.005	NA	250	250
REF2_3	1010	1750	10	0.25	3.18	0.05	4.5	0.5	0.25	REF2_3	1.1	18	1.8	0.3	0.05	5.6	2.7	0.005	NA	250	250
REF3_1	680	4050	5	0.25	3.88	0.05	4.6	0.5	0.25	REF3_1	1.2	41	1.8	0.1	0.2	15.9	2.4	0.005	NA	1020	520
REF3_2	560	3640	5	0.25	9.47	0.05	9.6	0.5	0.25	REF3_2	1.1	38	1.6	0.1	0.05	14.6	2	0.005	NA	250	250
REF3_3	650	4080	5	0.25	10.7	0.05	11	0.5	0.25	REF3_3	1.3	39	1.5	0.2	0.05	16.3	2.3	0.005	NA	250	250
REF4_1	640	3500	5	0.25	6.92	0.05	11.9	0.5	0.25	REF4_1	1	41	1.4	0.1	0.05	13.7	2.8	0.005	NA	250	250
REF4_2	600	2960	5	0.25	5.08	0.05	9.5	0.5	0.25	REF4_2	0.5	32	1.5	0.1	0.05	9.8	2.6	0.005	NA	250	250
REF4_3	690	3860	5	0.25	7.93	0.1	13.1	0.5	0.25	REF4_3	1.1	45	1.7	0.1	0.05	15.7	2.7	0.005	NA	550	250
REF5_1	680	3690	5	0.52	7.8	0.1	11.4	0.5	0.25	REF5_1	1.2	38	1.6	0.05	0.05	15.6	2.6	0.005	NA	250	250
REF5_2	500	2310	5	0.25	4.15	0.05	7.9	0.5	0.25	REF5_2	1	25	1.4	0.05	0.05	9	2.4	0.005	NA	700	250
REF5_3	620	3330	5	0.25	6.95	0.1	9.9	0.5	0.25	REF5_3	1.2	37	1.5	0.1	0.05	13.4	2.7	0.005	NA	250	250
REF6_1	660	2560	5	0.25	5.44	0.1	7.3	0.5	0.25	REF6_1	1.2	40	2.4	0.2	0.05	10.3	2.6	0.005	NA	780	250
REF6_2	570	2560	5	0.25	5.62	0.1	8.6	0.5	0.25	REF6_2	1.2	34	1.6	0.1	0.05	11.5	2.2	0.005	NA	980	250
REF6_3	580	2390	5	0.25	4.97	0.1	7.8	0.5	0.25	REF6_3	1.1	31	1.9	0.1	0.05	10	3	0.005	NA	530	250
REF7_1	560	2640	5	0.54	5.54	0.1	9.3	0.5	0.25	REF7_1	1.1	47	1.6	0.1	0.05	10.3	2.7	0.005	NA	250	250
REF7_2	630	3580	5	0.6	7.54	0.05	12	0.5	0.25	REF7_2	1.1	42	1.6	0.1	0.05	14.2	2.4	0.005	NA	780	250
REF7_3	570	2730	5	0.25	6.1	0.1	9.8	0.5	0.25	REF7_3	1	40	1.6	0.05	0.05	11.2	2.6	0.005	NA	700	250
REF8_1	790	5830	5	0.59	19.4	0.05	15.2	0.5	0.25	REF8_1	1.6	37	1.4	0.1	0.05	26.8	2.2	0.005	NA	250	250
REF8_2	730	4720	5	0.25	16.2	0.05	13.2	0.5	0.25	REF8_2	1.3	28	1.3	0.1	0.05	21.9	2.1	0.005	NA	250	250
REF8_3	630	4450	5	0.25	16.5	0.05	13	0.5	0.25	REF8_3	1.4	29	1.4	0.05	0.05	22.7	2.2	0.005	NA	550	250
REF9_1	730	2860	5	0.25	4.98	0.1	9.5	0.5	0.25	REF9_1	1.3	36	2.2	0.1	0.05	11.5	3	0.005	NA	840	570
REF9_2	590	2300	5	0.25	6.1	0.2	7	0.5	0.25	REF9_2	1	26	1.8	0.2	0.05	11.9	2.4	0.005	NA	550	250
REF9_3	510	2150	5	0.25	3.86	0.1	6.9	0.5	0.25	REF9_3	1	25	1.7	0.1	0.05	9	2.4	0.005	NA	610	500
REF10_1	1270	9000	5	0.61	37.8	0.05	16.1	0.5	0.6	REF10_1	1.9	64	2.2	0.2	0.05	41.8	3.2	0.005	NA	250	250
REF10_2	1230	6910	5	0.56	27	0.05	13.5	0.5	0.25	REF10_2	1.8	45	2.4	0.2	0.05	33.6	3.7	0.005	NA	500	250
REF10_3	1170	6880	5	0.25	25.6	0.05	13.7	0.5	0.5	REF10_3	1.7	44	1.8	0.2	0.05	32.5	2.9	0.005	NA	660	250
REF11_1	1140	3260	10	0.25	7.66	0.1	8.7	0.5	0.25	REF11_1	1.4	34	1.8	0.2	0.05	13.5	2.5	0.005	NA	250	250
REF11_2	1180	1760	10	0.25	4.36	0.1	6.2	1.2	0.25	REF11_2	1.6	25	2.3	0.2	0.05	7.7	3.1	0.005	NA	250	250
REF11_3	800	2510	10	0.25	6.11	0.05	5.9	0.5	0.25	REF11_3	1.2	33	1.7	0.2	0.05	9.2	2.2	0.005	NA	570	250
REF12_1	670	1920	10	0.25	3.22	0.05	5.2	0.5	0.25	REF12_1	0.5	15	1.9	0.1	0.05	6.8	1.8	0.005	NA	250	250
REF12_2	660	2750	10	0.25	4.97	0.05	6.7	0.5	0.25	REF12_2	1.2	17	1.6	0.1	0.05	9.3	2.3	0.005	NA	530	250
REF12_3	570	2050	10	0.25	3.73	0.05	5.4	0.5	0.25	REF12_3	0.5	12	1.7	0.05	0.05	7.7	2.1	0.005	NA	990	250
REF13_1	680	2800	5	0.25	6.38	0.05	6.2	0.5	0.25	REF13_1	1.1	36	1.6	0.1	0.05	9.9	1.7	0.005	NA	250	250
REF13_2	840	3270	5	0.25	7.77	0.05	7.7	0.5	0.25	REF13_2	1.3	35	1.6	0.2	0.05	12.4	2.4	0.005	NA	250	250
REF13_3	920	2580	5	0.25	7.08	0.1	7.1	0.5	0.25	REF13_3	1.5	39	2.5	0.3	0.05	10.2	3	0.005	NA	250	250
REF14_1	880	3000	5	0.25	9.63	0.1	9.2	0.5	0.25	REF14_1	1.4	42	2.1	0.2	0.05	16.1	3.3	0.005	NA	250	250
REF14_2	920	2890	10	0.51	7.98	0.1	8.7	0.5	0.25	REF14_2	1.3	36	1.9	0.2	0.05	13.7	2.7	0.005	NA	250	250
REF14_3	960	2890	10	0.25	6.93	0.2	8.9	1	0.25	REF14_3	1.5	37	2.3	0.2	0.05	12.9	3	0.005	NA	250	250
REF15_1	1140	5840	5	0.25	20.3	0.05	12.2	0.5	0.25	REF15_1	1.3	40	1.9	0.1	0.05	27.1	2.6	0.005	NA	250	250
REF15_2	1100	5640	5	0.25	20.1	0.05	11.8	0.5	0.25	REF15_2	1.4	45	1.9	0.2	0.05	25.9	4.9	0.005	NA	250	250
REF15_3	1110	6480	5	0.25	23.6	0.05	13.8	0.5	0.25	REF15_3	1.4	52	1.6	0.1	0.05	29.5	2.7	0.005	NA	250	250
REF16_1	890	4070	5	0.5	9.78	0.1	9.7	0.5	0.25	REF16_1	1.8	43	1.9	0.4	0.05	15.2	2.7	0.005	NA	250	250
REF16_2	840	2940	5	0.25	6.79	0.1	7.8	0.5	0.25	REF16_2	1.4	35	2	0.2	0.05	11.3	2.9	0.005	NA	250	250
REF16_3	590	2170	5	0.25	8.13	0.1	7.5	1.1	0.25	REF16_3	1.6	51	2.3	0.3	0.05	10.3	3	0.005	NA	250	250
REF17_1	1530	1790	20	0.25	2.81	0.05	5.9	0.5	0.25	REF17_1	1.4	19	2.3	0.2	0.05	7.7	2.9	0.005	NA	250	250
REF17_2	2320	2800	30	0.25	3.66	0.05	6.5	1.1	0.25	REF17_2	1.8	22	3.2	0.3	0.05	8.6	3.8	0.005	NA	250	250
REF17_3	1400	1890	20	0.25	2.9	0.05	5.3	0.5	0.25	REF17_3	1.2	15	1.8	0.2	0.05	6.9	2.2	0.005	NA	250	250
REF18_1	680	2850	5	0.25	5.33	0.1	8.6	0.5	0.25	REF18_1	1.2	33	2.1	0.1	0.05	11.7	2.7	0.005	NA	1060	640

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	SampleID_	Lead	Manganese	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	Methyl me	GrossAlpha	GrossBeta
REF18_2	500	2400	5	0.25	4.69	0.1	7	0.5	0.25	REF18_2	1	28	1.5	0.1	0.05	9.6	2	0.005	NA	640	250
REF18_3	620	2470	5	0.25	4.82	0.1	8	0.5	0.25	REF18_3	1.2	30	1.7	0.1	0.1	10.1	2.4	0.005	NA	720	250
REF_T1A	510	2920	5	0.25	7.36	0.05	7.6	0.5	0.25	REF_T1A	1.2	37	1.4	0.05	0.05	10.8	1.8	0.005	NA	250	250
REF_T1B	430	2910	5	0.25	8.17	0.05	7.5	0.5	0.25	REF_T1B	1.1	37	1.2	0.1	0.05	12	1.8	0.005	NA	920	600
REF_T2A	550	3400	5	0.25	8.68	0.05	8.5	0.5	0.25	REF_T2A	1.2	34	1.4	0.1	0.05	13.1	1.8	0.005	NA	920	710
REF_T2B	650	3910	5	0.59	9.68	0.05	10.5	0.5	0.25	REF_T2B	1.3	38	1.5	0.05	0.05	15.3	2.1	0.005	NA	860	250
REF_T3A	510	2150	5	0.25	4.46	0.1	7.5	0.5	0.25	REF_T3A	1.3	35	1.8	0.1	0.2	9.9	2.6	0.005	NA	610	250
REF_T3B	510	2320	5	0.25	4.68	0.1	7.1	0.5	0.25	REF_T3B	1.1	36	1.7	0.1	0.1	10.9	2.6	0.005	NA	780	650
REF_T4A	710	5020	5	0.25	18	0.05	13.1	0.5	0.25	REF_T4A	1.3	29	0.5	0.05	0.05	22.8	4.5	0.005	NA	250	250
REF_T4B	710	5020	5	0.25	17.6	0.05	13.3	0.5	0.25	REF_T4B	1.4	30	1.2	0.1	0.05	23.7	1.9	0.005	NA	250	250
REF_T5A	710	5090	5	0.25	17.3	0.05	13.1	0.5	0.25	REF_T5A	1.3	32	1.3	0.1	0.2	23.1	1.8	0.005	NA	250	250
REF_T5B	730	5020	5	0.25	17.7	0.05	13.1	0.5	0.25	REF_T5B	1.3	33	1.2	0.05	0.05	22.4	2.1	0.005	NA	250	250

SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plu	PS2360plu	PS4750plu	PS9500plu	PS19000pl	PS37500pl	PS75000pl	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
REF1_1	-40	5136.40	8324.06	28.7	95	78	22	16	12	REF1_1	8	4	2	0.5	0.5	0.5	0.5	0.225	REF1_1	5	0.5	90	5	0.5	2.57
REF1_2	-38	5334.70	8062.26	22.9	96	83	12	6	4	REF1_2	2	1	1	0.5	0.5	0.5	0.5	0.219	REF1_2	4	0.5	94	2	0.5	2.63
REF1_3	-39	5961.99	8944.55	23.9	97	86	14	8	5	REF1_3	3	1	0.5	0.5	0.5	0.5	0.5	0.225	REF1_3	3	0.5	95	2	0.5	2.63
REF2_1	-53	7890.86	9296.24	41.2	87	81	73	69	64	REF2_1	50	25	15	6	0.5	0.5	0.5	1.18	REF2_1	9	4	54	33	0.5	2.41
REF2_2	-53	8463.93	8480.71	40.1	86	76	59	53	46	REF2_2	30	11	8	6	0.5	0.5	0.5	0.5	REF2_2	7	7	69	17	0.5	2.41
REF2_3	-52.75	7419.87	9062.28	41.5	79	67	57	53	49	REF2_3	40	21	11	3	0.5	0.5	0.5	0.556	REF2_3	10	9	54	27	0.5	2.33
REF3_1	-72.75	6390.41	12723.31	32.3	94	87	59	44	31	REF3_1	12	2	0.5	0.5	0.5	0.5	0.5	0.375	REF3_1	6	0.5	89	5	0.5	2.52
REF3_2	-72	6570.23	12624.58	31.7	96	90	59	43	30	REF3_2	10	2	0.5	0.5	0.5	0.5	0.5	0.37	REF3_2	4	0.5	92	4	0.5	2.5
REF3_3	-72	6390.21	12391.63	31.8	95	86	52	37	25	REF3_3	8	1	0.5	0.5	0.5	0.5	0.5	0.317	REF3_3	5	0.5	92	3	0.5	2.53
REF4_1	-93	3977.58	10894.15	27.7	98	83	47	34	22	REF4_1	6	1	0.5	0.5	0.5	0.5	0.5	0.288	REF4_1	2	0.5	96	2	0.5	2.55
REF4_2	-103.75	5357.03	12305.38	27.4	100	82	40	27	16	REF4_2	5	2	0.5	0.5	0.5	0.5	0.5	0.264	REF4_2	0.5	0.5	97	3	0.5	2.53
REF4_3	-97	4352.80	10898.74	29.1	98	87	54	40	26	REF4_3	7	1	0.5	0.5	0.5	0.5	0.5	0.336	REF4_3	2	0.5	95	3	0.5	2.52
REF5_1	-78	6743.98	9200.14	30.8	97	85	56	43	27	REF5_1	7	2	0.5	0.5	0.5	0.5	0.5	0.358	REF5_1	3	0.5	94	3	0.5	2.49
REF5_2	-80.5	6604.58	10353.38	33.2	97	84	50	38	28	REF5_2	11	3	0.5	0.5	0.5	0.5	0.5	0.3	REF5_2	3	0.5	92	5	0.5	2.45
REF5_3	-78	7021.03	9652.07	30.7	96	88	64	44	29	REF5_3	10	2	0.5	0.5	0.5	0.5	0.5	0.388	REF5_3	5	0.5	91	4	0.5	2.49
REF6_1	-75	5994.90	9348.40	44	91	76	43	32	22	REF6_1	9	2	0.5	0.5	0.5	0.5	0.5	0.268	REF6_1	9	0.5	87	4	0.5	2.56
REF6_2	-75	6021.13	9156.01	34	92	80	50	36	26	REF6_2	11	3	0.5	0.5	0.5	0.5	0.5	0.3	REF6_2	8	0.5	86	6	0.5	2.45
REF6_3	-76	6868.35	10214.94	33.8	90	74	39	28	21	REF6_3	9	2	0.5	0.5	0.5	0.5	0.5	0.253	REF6_3	10	0.5	86	4	0.5	2.56
REF7_1	-102.25	2010.45	11554.44	31	98	86	56	43	29	REF7_1	8	2	2	2	0.5	0.5	0.5	0.358	REF7_1	2	0.5	94	4	0.5	2.54
REF7_2	-95	1285.30	10986.92	27.8	98	85	55	39	23	REF7_2	6	2	0.5	0.5	0.5	0.5	0.5	0.339	REF7_2	2	0.5	95	3	0.5	2.6
REF7_3	-89	929.90	10239.38	28.6	98	88	56	39	24	REF7_3	7	2	0.5	0.5	0.5	0.5	0.5	0.344	REF7_3	2	0.5	95	3	0.5	2.59
REF8_1	-39	6388.48	9235.39	24.8	97	78	12	8	5	REF8_1	3	2	2	1	0.5	0.5	0.5	0.214	REF8_1	3	0.5	94	3	0.5	2.61
REF8_2	-38	6947.76	9570.79	23.9	98	82	11	6	4	REF8_2	2	0.5	0.5	0.5	0.5	0.5	0.5	0.218	REF8_2	2	0.5	97	1	0.5	2.64
REF8_3	-38	7140.82	10543.36	23.4	97	84	10	7	5	REF8_3	3	1	0.5	0.5	0.5	0.5	0.5	0.22	REF8_3	3	0.5	95	2	0.5	2.61
REF9_1	-75	8587.22	11869.71	38.8	92	76	37	26	19	REF9_1	10	4	2	0.5	0.5	0.5	0.5	0.25	REF9_1	8	0.5	87	5	0.5	2.48
REF9_2	-75	8368.04	11573.25	40.4	91	80	49	38	30	REF9_2	15	4	0.5	0.5	0.5	0.5	0.5	0.295	REF9_2	9	0.5	84	7	0.5	2.46
REF9_3	-76	7633.06	10953.20	38.5	95	86	65	56	46	REF9_3	26	11	4	2	0.5	0.5	0.5	0.53	REF9_3	5	0.5	80	15	0.5	2.53
REF10_1	-46	6399.72	13832.66	33	96	94	73	60	48	REF10_1	27	9	4	2	0.5	0.5	0.5	0.571	REF10_1	4	0.5	82	14	0.5	2.46
REF10_2	-46	6418.08	12975.75	36.1	97	96	75	61	52	REF10_2	33	16	5	1	0.5	0.5	0.5	0.661	REF10_2	3	0.5	75	22	0.5	2.45
REF10_3	-46	6279.33	13920.22	34.7	98	95	70	57	46	REF10_3	25	7	2	0.5	0.5	0.5	0.5	0.536	REF10_3	2	0.5	86	12	0.5	2.46
REF11_1	-60	7176.75	9937.93	32.8	99	98	77	52	28	REF11_1	6	0.5	0.5	0.5	0.5	0.5	0.5	0.44	REF11_1	1	0.5	97	2	0.5	2.4
REF11_2	-60	6758.92	8829.07	34	89	81	66	58	50	REF11_2	31	11	8	6	0.5	0.5	0.5	0.6	REF11_2	7	3	73	17	0.5	2.3
REF11_3	-61	7041.75	10012.49	33.8	95	90	77	68	58	REF11_3	42	22	14	9	0.5	0.5	0.5	0.89	REF11_3	5	0.5	67	28	0.5	2.31
REF12_1	-61	6918.53	11649.89	34.8	92	78	58	49	42	REF12_1	29	15	7	2	0.5	0.5	0.5	0.411	REF12_1	4	0.5	77	19	0.5	2.44
REF12_2	-60.5	6154.78	10868.76	33.2	96	88	69	55	42	REF12_2	23	6	2	0.5	0.5	0.5	0.5	0.488	REF12_2	2	0.5	87	11	0.5	2.5
SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plu	PS2360plu	PS4750plu	PS9500plu	PS19000pl	PS37500pl	PS75000pl	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
REF12_3	-60.5	6053.10	11035.96	32.8	94	85	59	41	28	REF12_3	14	7	3	0.5	0.5	0.5	0.5	0.363	REF12_3	2	0.5	89	9	0.5	2.51
REF13_1	-71.75	7392.28	19148.11	34.5	97	94	79	68	56	REF13_1	36	16	5	0.5	0.5	0.5	0.5	0.774	REF13_1	3	0.5	75	22	0.5	2.46
REF13_2	-72.75	6467.55	18818.21	38.2	93	86	56	42	31	REF13_2	16	5	2	0.5	0.5	0.5	0.5	0.354	REF13_2	6	0.5	86	8	0.5	2.45
REF13_3	-72	7049.69	18040.86	38.5	92	86	72	64	58	REF13_3	45	26	15	6	0.5	0.5	0.5	0.957	REF13_3	8	0.5	60	32	0.5	2.34
REF14_1	-74.5	4012.47	10683.16	35.4	91	84	53	39	28	REF14_1	12	3	1	0.5	0.5	0.5	0.5	0.327	REF14_1	9	0.5	85	6	0.5	2.51
REF14_2	-75.25	5066.15	9491.71	37.7	92	84	57	43	31	REF14_2	14	3	0.5	0.5	0.5	0.5	0.5	0.363	REF14_2	9	0.5	85	6	0.5	2.54
REF14_3	-75.75	5141.71	10203.55	44.5	92	84	50	36	26	REF14_3	11	4	2	2	0.5	0.5	0.5	0.3	REF14_3	8	0.5	86	6	0.5	2.54
REF15_1	-47	7592.43	8626.70	29.5	97	94	68	58	50	REF15_1	36	20	12	7	0.5	0.5	0.5	0.6	REF15_1	3	0.5	72	25	0.5	2.48
REF15_2	-47.25	7520.33	9014.71	32.1	97	93	57	44	34	REF15_2	19	5	0.5	0.5	0.5	0.5	0.5	0.367	REF15_2	3	0.5	88	9	0.5	2.48
REF15_3	-47	7601.41	8808.66	28	98	94	59	45	34	REF15_3	19	6	1	0.5	0.5	0.5	0.5	0.38	REF15_3	3	0.5	87	10	0.5	2.49
REF16_1	-74	4353.50	16970.05	36.9	94	87	57	43	32	REF16_1	17	6	4	3	0.5	0.5	0.5	0.371	REF16_1	5	0.5	85	10	0.5	2.47
REF16_2	-74.25	3527.65	16544.64	41.9	92	83	51	36	25	REF16_2	11	2	0.5	0.5	0.5	0.5	0.5	0.308	REF16_2	8	0.5	87	5	0.5	2.45
REF16_3	-74	4209.14	16602.56	43.6	94	86	58	44	33	REF16_3	16	4	0.5	0.5	0.5	0.5	0.5	0.363	REF16_3	5	0.5	88	7	0.5	2.43
REF17_1	-58	8617.39	14198.77	44.9	91	75	50	40	31	REF17_1	17	5	2	0.5	0.5	0.5	0.5	0.3	REF17_1	9	0.5	82	9	0.5	2.29
REF17_2	-59	7476.38	15134.73	43.2	87	78	62	55	47	REF17_2	30	12	3	0.5	0.5	0.5	0.5	0.534	REF17_2	10	3	70	17	0.5	2.37
REF17_3	-59.5	8322.07	13416.50	40.3	90	80	59	49	40	REF17_3	26	14	6	0.5	0.5	0.5	0.5	0.413	REF17_3	9	0.5	74	17	0.5	2.38
REF18_1	-75	7875.03	11200.89	35	92	75	38	28	21	REF18_1	10	4	1	1	0.5	0.5	0.5	0.251	REF18_1	8	0.5	87	5	0.5	2.52
REF18_2	-75.5	7050.05	10464.46	35.9	96	82	50	38	28	REF18_2	14	5	2	0.5	0.5	0.5	0.5	0.3	REF18_2	5	0.5	88	7	0.5	2.55
REF18_3	-76	6504.58	9856.09	35.4	93	81	52	38	28	REF18_3	13	4	0.5	0.5	0.5	0.5	0.5	0.318	REF18_3	7	0.5	86	7	0.5	2.52
REF_T1A	-72	6570.23	12624.58	30.6	96	89	59	43	29	REF_T1A	10	2	0.5	0.5	0.5	0.5	0.5	0.37	REF_T1A	4	0.5	92	4	0.5	2.51
REF_T1B	-72	6570.23	12624.58	29.5	95	88	60	45	31	REF_T1B	11	3	2	0.5	0.5	0.5	0.5	0.383	REF_T1B	5	0.5	90	5	0.5	2.54
REF_T2A	-72	6390.21	12391.63	28.1	93	87	54	39	26	REF_T2A	9	1	0.5	0.5	0.5	0.5	0.5	0.333	REF_T2A	7	0.5	89	4	0.5	2.52
REF_T2B	-72	6390.21	12391.63	26.6	94	85	53	39	27	REF_T2B	11	2	0.5	0.5	0.5	0.5	0.5	0.327	REF_T2B	7	0.5	88	5	0.5	2.57
REF_T3A	-75	7875.03	11200.89	35.8	88	72	37	27	20	REF_T3A	8	2	0.5	0.5	0.5	0.5	0.5	0.244	REF_T3A	6	2	88	4	0.5	2.57
REF_T3B	-75	7875.03	11200.89	35.3	89	76	45	36	27	REF_T3B	12	3	0.5	0.5	0.5	0.5	0.5	0.276	REF_T3B	7	1	86	6	0.5	2.55
REF_T4A	-38	6947.76	9570.79	25.2	99	88	16	10	7	REF_T4A	4	2	1	0.5	0.5	0.5	0.5	0.23	REF_T4A	1	0.5	96	3	0.5	2.61
REF_T4B	-38	6947.76	9570.79	23.8	99	83	11	7	4	REF_T4B	2	0.5	0.5	0.5	0.5	0.5	0.5	0.219	REF_T4B	1	0.5	98	1	0.5	2.6
REF_T5A	-39	5961.99	8944.55	25.5	98	88	16	10	7	REF_T5A	4	3	2	0.5	0.5	0.5	0.5	0.229	REF_T5A	2	0.5	94	4	0.5	2.58
REF_T5B	-39	5961.99	8944.55	23.6	98	85	24	18	14	REF_T5B	10	6	4	0.5	0.5	0.5	0.5	0.238	REF_T5B	2	0.5	90	8	0.5	2.57

SampleID_	MoistureC	Nitrite + Ni	Total Kjeld	Total Nitro	Total Phos	Total Orga	Total Carb	Total Inorganic Carbon
REF1_1	28.7	0.3	350	350	388	0.15	5.19	5.04
REF1_2	22.9	0.4	190	190	365	0.1	3.52	3.42
REF1_3	23.9	0.4	280	280	329	0.13	3.1	2.97
REF2_1	41.2	0.1	820	820	445	0.3	11.1	10.8
REF2_2	40.1	0.1	780	780	500	0.35	11.1	10.8
REF2_3	41.5	0.2	820	820	413	0.34	10.8	10.5
REF3_1	32.3	0.8	480	480	589	0.26	9.2	8.94
REF3_2	31.7	0.4	540	540	422	0.24	9.35	9.11
REF3_3	31.8	0.5	290	290	365	0.23	8.7	8.47
REF4_1	27.7	0.5	270	270	544	0.17	9	8.83
REF4_2	27.4	0.8	180	180	393	0.18	8.97	8.79
REF4_3	29.1	0.4	220	220	607	0.18	9.14	8.96
REF5_1	30.8	0.5	290	290	498	0.21	10.8	10.6
REF5_2	33.2	0.4	390	390	506	0.24	10.6	10.4
REF5_3	30.7	0.9	380	380	610	0.2	10.7	10.5
REF6_1	44	0.4	720	720	610	0.34	10.9	10.6
REF6_2	34	0.4	540	540	568	0.37	11.1	10.7
REF6_3	33.8	0.7	550	550	428	0.41	11.1	10.7
REF7_1	31	0.6	280	280	567	0.24	9.77	9.53
REF7_2	27.8	0.05	340	340	626	0.23	9.57	9.34
REF7_3	28.6	0.6	270	270	576	0.23	9.74	9.51
REF8_1	24.8	0.1	150	150	303	0.1	3.73	3.63
REF8_2	23.9	0.1	190	190	389	0.09	3.35	3.26
REF8_3	23.4	0.3	240	240	463	0.1	3.56	3.46
REF9_1	38.8	0.8	490	490	532	0.35	11	10.6
REF9_2	40.4	0.2	570	570	616	0.35	11.1	10.8
REF9_3	38.5	0.3	580	580	520	0.33	11.1	10.8
REF10_1	33	0.3	340	340	575	0.23	9.79	9.56
REF10_2	36.1	1.3	380	380	581	0.17	9.65	9.48
REF10_3	34.7	0.05	280	280	370	0.21	9.61	9.4
REF11_1	32.8	0.3	240	240	327	0.25	10.8	10.6
REF11_2	34	0.7	530	530	318	0.46	10.9	10.4
REF11_3	33.8	3.5	330	330	291	0.27	10.6	10.3
REF12_1	34.8	0.1	410	410	355	0.28	9.46	9.18
REF12_2	33.2	0.1	460	460	404	0.2	7.9	7.7
SampleID_	MoistureC	Nitrite + Ni	Total Kjeld	Total Nitro	Total Phos	Total Orga	Total Carb	Total Inorganic Carbon
REF12_3	32.8	0.1	280	280	281	0.22	7.75	7.53
REF13_1	34.5	0.4	320	320	391	0.21	10.9	10.7
REF13_2	38.2	0.4	320	320	445	0.28	11	10.7
REF13_3	38.5	0.2	760	760	328	0.41	11	10.6
REF14_1	35.4	0.2	620	620	455	0.4	11.1	10.7
REF14_2	37.7	0.05	520	520	411	0.34	10.9	10.6
REF14_3	44.5	0.05	550	550	570	0.31	10.7	10.4
REF15_1	29.5	0.2	220	220	428	0.21	8.36	8.15
REF15_2	32.1	0.4	370	370	640	0.19	8.29	8.1
REF15_3	28	1.4	220	220	378	0.18	8.41	8.23
REF16_1	36.9	0.4	560	560	390	0.25	10.7	10.4
REF16_2	41.9	0.3	890	890	425	0.27	10.8	10.5
REF16_3	43.6	0.5	720	720	448	0.36	11.1	10.7
REF17_1	44.9	0.05	510	510	422	0.26	11.2	10.9
REF17_2	43.2	0.05	540	540	401	0.32	11.2	10.9
REF17_3	40.3	0.05	370	370	344	0.27	11.3	11
REF18_1	35	0.2	620	620	470	0.36	11.1	10.7
REF18_2	35.9	0.2	930	930	538	0.26	11.1	10.8
REF18_3	35.4	0.7	370	370	527	0.3	11.1	10.8
REF_T1A	30.6	0.4	250	250	377	0.2	9.03	8.83
REF_T1B	29.5	0.4	380	380	519	0.21	9.24	9.03
REF_T2A	28.1	0.4	570	570	533	0.22	8.86	8.64
REF_T2B	26.6	0.3	280	280	439	0.17	8.74	8.57
REF_T3A	35.8	0.7	380	380	438	0.37	11	10.6
REF_T3B	35.3	1.1	430	430	460	0.33	11	10.7
REF_T4A	25.2	0.1	280	280	383	0.12	3.3	3.18
REF_T4B	23.8	0.2	270	270	332	0.13	3.04	2.91
REF_T5A	25.5	0.3	370	370	312	0.12	3.59	3.47
REF_T5B	23.6	0.3	180	180	310	0.12	3.49	3.37

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	SampleID_	Total Orga	Pyrene	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum
WTA1	0.38	2.5	2.5	2	2	2	2	2	2	WTA1	0.38	2	2	2	2	2	2	2	2	WTA1	0.38	2	2	2	2.5	2
WTA3	0.37	2.5	2.5	2	2	2	2	2	2	WTA3	0.37	2	2	2	2	2	2	2	2	WTA3	0.37	2	2	2	2.5	2
WTA4	0.31	2.5	6	2	2	2	2	2	2	WTA4	0.31	2	2	2	2	2	2	2	2	WTA4	0.31	2	2	2	2.5	6
WTA5	0.36	2.5	2.5	2	2	2	2	2	2	WTA5	0.36	2	2	2	2	2	2	2	2	WTA5	0.36	2	2	2	2.5	2
WTA6	0.31	2.5	2.5	2	2	2	2	2	2	WTA6	0.31	2	2	2	2	2	2	2	2	WTA6	0.31	2	2	2	2.5	2
WTA7	0.73	2.5	2.5	2	2	2	2	2	2	WTA7	0.73	2	2	2	2	2	2	2	2	WTA7	0.73	2	2	2	2.5	2
WTA8	0.5	2.5	2.5	2	2	2	2	2	2	WTA8	0.5	2	2	2	2	2	2	2	2	WTA8	0.5	2	2	2	2.5	2
WTA9	0.37	8	14	2	2	2	6	2	2	WTA9	0.37	2	2	2	2	2	2	2	2	WTA9	0.37	2	2	2	2.5	28
WTA10	0.42	NA	NA	NA	NA	NA	NA	NA	NA	WTA10	0.42	NA	NA	NA	NA	NA	NA	NA	NA	WTA10	0.42	NA	NA	NA	NA	NA
WTA11	0.41	2.5	19	2	2	2	7	2	2	WTA11	0.41	2	2	2	2	2	2	2	2	WTA11	0.41	2	2	2	2.5	26
WTA12	0.32	2.5	2.5	2	2	2	2	2	2	WTA12	0.32	2	2	2	2	2	2	2	2	WTA12	0.32	2	2	2	2.5	2
WTA13	0.54	114	191	2	2	5	59	22	17	WTA13	0.54	12	9	8	4	2	2	6	10	WTA13	0.54	12	5	7	2.5	481
WTA14	0.26	13	15	2	2	2	2	2	2	WTA14	0.26	2	2	2	2	2	2	2	2	WTA14	0.26	2	2	2	2.5	28
WTA15	0.41	2.5	2.5	2	2	2	2	2	2	WTA15	0.41	2	2	2	2	2	2	2	11	WTA15	0.41	2	2	2	2.5	11
WTA16	0.28	2.5	2.5	2	2	2	2	2	2	WTA16	0.28	2	2	2	2	2	2	2	2	WTA16	0.28	2	2	2	2.5	2
WTA17	0.31	2.5	2.5	2	2	2	2	2	2	WTA17	0.31	2	2	2	2	2	2	2	2	WTA17	0.31	2	2	2	2.5	2
WTA18	0.38	2.5	2.5	2	2	2	2	2	2	WTA18	0.38	2	2	2	2	2	2	2	2	WTA18	0.38	2	2	2	2.5	2
WTA19	0.43	2.5	2.5	2	2	2	2	2	2	WTA19	0.43	2	2	2	2	2	2	2	2	WTA19	0.43	2	2	2	2.5	2
WTA20	0.41	2.5	2.5	2	2	2	2	2	2	WTA20	0.41	2	2	2	2	2	2	2	2	WTA20	0.41	2	2	2	2.5	2
WTA21	0.65	47	63	2	2	2	29	10	7	WTA21	0.65	6	5	4	2	2	2	4	2	WTA21	0.65	2	2	2	2.5	175
WTA22	0.44	2.5	2.5	2	2	2	2	2	2	WTA22	0.44	2	2	2	2	2	2	2	2	WTA22	0.44	2	2	2	2.5	2
WTA23	0.57	8	6	2	2	2	2	2	2	WTA23	0.57	2	2	2	2	2	2	2	2	WTA23	0.57	2	2	2	2.5	14
WTA24	0.46	2.5	2.5	2	2	2	2	2	2	WTA24	0.46	2	2	2	2	2	2	2	2	WTA24	0.46	2	2	2	2.5	2
WTA25	0.28	2.5	2.5	2	2	2	2	2	2	WTA25	0.28	2	2	2	2	2	2	2	2	WTA25	0.28	2	2	2	2.5	2
WTA37	0.44	2.5	2.5	2	2	2	2	2	2	WTA37	0.44	4	2	2	2	2	2	2	2	WTA37	0.44	2	2	2	2.5	4
WTA38	0.49	2.5	2.5	2	2	2	2	2	2	WTA38	0.49	2	2	2	2	2	2	2	2	WTA38	0.49	2	2	2	2.5	2
WTA39	0.4	2.5	2.5	2	2	2	2	2	2	WTA39	0.4	2	2	2	2	2	2	2	2	WTA39	0.4	2	2	2	2.5	2
WTA40	0.38	2.5	2.5	2	2	2	2	2	2	WTA40	0.38	2	2	2	2	2	2	2	2	WTA40	0.38	2	2	2	2.5	2
WTA41	0.44	2.5	2.5	2	2	2	2	2	2	WTA41	0.44	2	2	2	2	2	2	2	2	WTA41	0.44	2	2	2	2.5	2
WTA42	0.48	2.5	2.5	2	2	2	2	2	2	WTA42	0.48	2	2	2	2	2	2	2	2	WTA42	0.48	2	2	2	2.5	2

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2	Coronene	PAHsum
WTA1	0.38	6.58	6.58	5.26	5.26	5.26	5.26	5.26	5.26	5.26	WTA1	0.38	5.26	5.26	5.26	5.26	5.26	5.26	5.26	WTA1	0.38	5.26	5.26	5.26	6.58	5.26
WTA3	0.37	6.76	6.76	5.41	5.41	5.41	5.41	5.41	5.41	5.41	WTA3	0.37	5.41	5.41	5.41	5.41	5.41	5.41	5.41	WTA3	0.37	5.41	5.41	5.41	6.76	5.41
WTA4	0.31	8.06	19.35	6.45	6.45	6.45	6.45	6.45	6.45	6.45	WTA4	0.31	6.45	6.45	6.45	6.45	6.45	6.45	6.45	WTA4	0.31	6.45	6.45	6.45	8.06	19.35
WTA5	0.36	6.94	6.94	5.56	5.56	5.56	5.56	5.56	5.56	5.56	WTA5	0.36	5.56	5.56	5.56	5.56	5.56	5.56	5.56	WTA5	0.36	5.56	5.56	5.56	6.94	5.56
WTA6	0.31	8.06	8.06	6.45	6.45	6.45	6.45	6.45	6.45	6.45	WTA6	0.31	6.45	6.45	6.45	6.45	6.45	6.45	6.45	WTA6	0.31	6.45	6.45	6.45	8.06	6.45
WTA7	0.73	3.42	3.42	2.74	2.74	2.74	2.74	2.74	2.74	2.74	WTA7	0.73	2.74	2.74	2.74	2.74	2.74	2.74	2.74	WTA7	0.73	2.74	2.74	2.74	3.42	2.74
WTA8	0.50	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	WTA8	0.50	4.00	4.00	4.00	4.00	4.00	4.00	4.00	WTA8	0.50	4.00	4.00	4.00	5.00	4.00
WTA9	0.37	21.62	37.84	5.41	5.41	5.41	16.22	5.41	5.41	5.41	WTA9	0.37	5.41	5.41	5.41	5.41	5.41	5.41	5.41	WTA9	0.37	5.41	5.41	5.41	6.76	75.68
WTA10	0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	WTA10	0.42	NA	NA	NA	NA	NA	NA	NA	WTA10	0.42	NA	NA	NA	NA	NA
WTA11	0.41	6.10	46.34	4.88	4.88	4.88	17.07	4.88	4.88	4.88	WTA11	0.41	4.88	4.88	4.88	4.88	4.88	4.88	4.88	WTA11	0.41	4.88	4.88	4.88	6.10	63.41
WTA12	0.32	7.81	7.81	6.25	6.25	6.25	6.25	6.25	6.25	6.25	WTA12	0.32	6.25	6.25	6.25	6.25	6.25	6.25	6.25	WTA12	0.32	6.25	6.25	6.25	7.81	6.25
WTA13	0.54	211.11	353.70	3.70	3.70	9.26	109.26	40.74	31.48	22.22	WTA13	0.54	16.67	14.81	7.41	3.70	3.70	11.11	18.52	WTA13	0.54	22.22	9.26	12.96	4.63	890.74
WTA14	0.26	50.00	57.69	7.69	7.69	7.69	7.69	7.69	7.69	7.69	WTA14	0.26	7.69	7.69	7.69	7.69	7.69	7.69	7.69	WTA14	0.26	7.69	7.69	7.69	9.62	107.69
WTA15	0.41	6.10	6.10	4.88	4.88	4.88	4.88	4.88	4.88	4.88	WTA15	0.41	4.88	4.88	4.88	4.88	4.88	4.88	26.83	WTA15	0.41	4.88	4.88	4.88	6.10	26.83
WTA16	0.28	8.93	8.93	7.14	7.14	7.14	7.14	7.14	7.14	7.14	WTA16	0.28	7.14	7.14	7.14	7.14	7.14	7.14	7.14	WTA16	0.28	7.14	7.14	7.14	8.93	7.14
WTA17	0.31	8.06	8.06	6.45	6.45	6.45	6.45	6.45	6.45	6.45	WTA17	0.31	6.45	6.45	6.45	6.45	6.45	6.45	6.45	WTA17	0.31	6.45	6.45	6.45	8.06	6.45
WTA18	0.38	6.58	6.58	5.26	5.26	5.26	5.26	5.26	5.26	5.26	WTA18	0.38	5.26	5.26	5.26	5.26	5.26	5.26	5.26	WTA18	0.38	5.26	5.26	5.26	6.58	5.26
WTA19	0.43	5.81	5.81	4.65	4.65	4.65	4.65	4.65	4.65	4.65	WTA19	0.43	4.65	4.65	4.65	4.65	4.65	4.65	4.65	WTA19	0.43	4.65	4.65	4.65	5.81	4.65
WTA20	0.41	6.10	6.10	4.88	4.88	4.88	4.88	4.88	4.88	4.88	WTA20	0.41	4.88	4.88	4.88	4.88	4.88	4.88	4.88	WTA20	0.41	4.88	4.88	4.88	6.10	4.88
WTA21	0.65	72.31	96.92	3.08	3.08	3.08	44.62	15.38	10.77	9.23	WTA21	0.65	7.69	6.15	3.08	3.08	3.08	6.15	3.08	WTA21	0.65	3.08	3.08	3.08	3.85	269.23
WTA22	0.44	5.68	5.68	4.55	4.55	4.55	4.55	4.55	4.55	4.55	WTA22	0.44	4.55	4.55	4.55	4.55	4.55	4.55	4.55	WTA22	0.44	4.55	4.55	4.55	5.68	4.55
WTA23	0.57	14.04	10.53	3.51	3.51	3.51	3.51	3.51	3.51	3.51	WTA23	0.57	3.51	3.51	3.51	3.51	3.51	3.51	3.51	WTA23	0.57	3.51	3.51	3.51	4.39	24.56
WTA24	0.46	5.43	5.43	4.35	4.35	4.35	4.35	4.35	4.35	4.35	WTA24	0.46	4.35	4.35	4.35	4.35	4.35	4.35	4.35	WTA24	0.46	4.35	4.35	4.35	5.43	4.35
WTA25	0.28	8.93	8.93	7.14	7.14	7.14	7.14	7.14	7.14	7.14	WTA25	0.28	7.14	7.14	7.14	7.14	7.14	7.14	7.14	WTA25	0.28	7.14	7.14	7.14	8.93	7.14
WTA37	0.44	5.68	5.68	4.55	4.55	4.55	4.55	4.55	4.55	9.09	WTA37	0.44	4.55	4.55	4.55	4.55	4.55	4.55	4.55	WTA37	0.44	4.55	4.55	4.55	5.68	9.09
WTA38	0.49	5.10	5.10	4.08	4.08	4.08	4.08	4.08	4.08	4.08	WTA38	0.49	4.08	4.08	4.08	4.08	4.08	4.08	4.08	WTA38	0.49	4.08	4.08	4.08	5.10	4.08
WTA39	0.40	6.25	6.25	5.00	5.00	5.00	5.00	5.00	5.00	5.00	WTA39	0.40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	WTA39	0.40	5.00	5.00	5.00	6.25	5.00
WTA40	0.38	6.58	6.58	5.26	5.26	5.26	5.26	5.26	5.26	5.26	WTA40	0.38	5.26	5.26	5.26	5.26	5.26	5.26	5.26	WTA40	0.38	5.26	5.26	5.26	6.58	5.26
WTA41	0.44	5.68	5.68	4.55	4.55	4.55	4.55	4.55	4.55	4.55	WTA41	0.44	4.55	4.55	4.55	4.55	4.55	4.55	4.55	WTA41	0.44	4.55	4.55	4.55	5.68	4.55
WTA42	0.48	5.21	5.21	4.17	4.17	4.17	4.17	4.17	4.17	4.17	WTA42	0.48	4.17	4.17	4.17	4.17	4.17	4.17	4.17	WTA42	0.48	4.17	4.17	4.17	5.21	4.17

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	Lead	SampleID_	Manganes	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	Methyl me	GrossAlpha	GrossBeta
WTA1	1240	1820	80	0.25	2.68	0.05	5.9	0.5	0.25	1.5	WTA1	18	2.5	0.2	0.05	6.4	3.7	0.005	NA	NA	NA
WTA3	1180	1750	20	0.25	2.66	0.05	5.5	0.5	0.25	1.4	WTA3	19	2.5	0.2	0.05	6.4	3	0.005	NA	NA	NA
WTA4	640	1820	380	0.25	2.35	0.1	3.9	0.5	0.25	3.4	WTA4	17	1.4	0.05	0.05	4.4	11.5	0.005	NA	250	250
WTA5	1230	1950	20	0.25	3.19	0.05	6	0.5	0.25	1.4	WTA5	21	2.2	0.2	0.05	7	3.1	0.005	NA	NA	NA
WTA6	880	1500	230	0.25	2.69	0.05	4.6	0.5	0.25	1.2	WTA6	17	1.8	0.1	0.05	5.4	2.8	0.005	NA	NA	NA
WTA7	2100	2550	90	0.25	3.14	0.1	7.8	1.3	0.5	2	WTA7	25	4.1	0.4	0.05	8.8	4.7	0.005	NA	NA	NA
WTA8	1680	2180	40	0.25	2.74	0.1	7.4	1.2	0.25	1.9	WTA8	24	3.1	0.2	0.05	7.9	4.4	0.005	NA	NA	NA
WTA9	860	1810	280	0.25	2.67	0.05	4.9	0.5	0.25	1.2	WTA9	22	1.8	0.2	0.05	6	7.2	0.005	NA	250	250
WTA10	1320	1900	140	0.25	3.57	0.05	6.3	0.5	0.25	1.4	WTA10	20	2	0.2	0.05	7	3.5	0.005	NA	NA	NA
WTA11	950	1730	120	0.25	2.71	0.05	5.4	0.5	0.25	1.4	WTA11	20	2.3	0.2	0.05	6.2	3.9	0.005	NA	1440	250
WTA12	700	1250	20	0.25	2.24	0.05	4.2	0.5	0.25	1.1	WTA12	17	1.2	0.1	0.05	4.5	1.9	0.005	NA	NA	NA
WTA13	1190	2050	410	0.25	3.3	0.05	5.2	0.5	0.25	1.5	WTA13	19	2	0.3	0.05	6.4	4.5	0.005	NA	520	250
WTA14	1370	1950	420	0.25	2.87	0.05	5.4	1.1	0.25	1.4	WTA14	18	2.2	0.2	0.05	6	5.2	0.005	NA	860	250
WTA15	1420	1910	80	0.25	2.6	0.05	6	0.5	0.25	1.6	WTA15	20	2.6	0.2	0.05	6.6	4.3	0.005	NA	NA	NA
WTA16	820	1900	90	0.25	3.05	0.05	6.2	0.5	0.25	1.4	WTA16	23	1.7	0.2	0.05	6.1	3.4	0.005	NA	1320	250
WTA17	730	1460	50	0.25	2.64	0.05	4.2	0.5	0.25	1.2	WTA17	13	1.4	0.2	0.05	5	1.7	0.005	NA	NA	NA
WTA18	1080	1650	60	0.25	2.7	0.05	5.2	0.5	0.25	1.3	WTA18	17	2.2	0.2	0.05	5.9	2.9	0.005	NA	NA	NA
WTA19	1120	1800	50	0.25	3.07	0.05	5.5	0.5	0.25	1.5	WTA19	20	2.2	0.2	0.05	6.6	2.9	0.005	NA	NA	NA
WTA20	1230	1880	30	0.25	2.76	0.1	5.7	0.5	0.25	1.5	WTA20	18	2.3	0.2	0.05	6.3	3.5	0.005	NA	NA	NA
WTA21	1010	1680	110	0.25	2.94	0.05	5.2	0.5	0.25	1.4	WTA21	18	2	0.2	0.05	5.7	4.6	0.005	NA	250	250
WTA22	1480	1950	20	0.25	2.53	0.05	6.4	0.5	0.25	1.5	WTA22	20	2.8	0.3	0.05	7.9	3.6	0.005	NA	NA	NA
WTA23	2070	2640	50	0.25	3.23	0.05	8	1.4	0.6	2.1	WTA23	25	4.1	0.2	0.05	9.4	4.8	0.005	NA	NA	NA
WTA24	1000	1460	20	0.25	2.1	0.05	4.4	0.5	0.25	1.2	WTA24	15	2.1	0.2	0.05	4.9	2.6	0.005	NA	NA	NA
WTA25	910	1970	590	0.25	3.37	0.1	4.9	0.5	0.25	1.2	WTA25	20	1.7	0.2	0.05	5.8	5.4	0.005	NA	250	250
WTA37	1030	1600	40	0.25	2.59	0.05	5.6	0.5	0.25	1.4	WTA37	19	2.6	0.2	0.05	6.5	3.4	0.005	NA	NA	NA
WTA38	1180	1740	30	0.25	2.58	0.05	5.9	0.5	0.25	1.4	WTA38	20	2.3	0.2	0.05	6.1	2.9	0.005	NA	NA	NA
WTA39	1540	2120	250	0.25	2.91	0.05	6.4	0.5	0.25	1.8	WTA39	18	2.6	0.3	0.05	7.7	3.4	0.005	NA	NA	NA
WTA40	1330	1930	320	0.25	2.71	0.05	6.3	0.5	0.25	1.5	WTA40	19	2.6	0.2	0.05	7	3.4	0.005	NA	NA	NA
WTA41	910	1380	20	0.25	2.15	0.05	4.7	0.5	0.25	1.2	WTA41	17	2	0.1	0.05	5.7	3.1	0.005	NA	NA	NA
WTA42	1060	1380	20	0.25	1.9	0.05	4.6	0.5	0.25	1.4	WTA42	16	2.1	0.2	0.05	5.1	2.7	0.005	NA	NA	NA

SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plu	PS2360plu	PS4750plu	PS9500plu	PS19000pl	PS37500pl	PS75000pl	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
WTA1	-53.00	376.93	390.51	37.60	79.00	61.00	50.00	45.00	40.00	WTA1	30.00	15.00	9.00	4.00	0.50	0.50	0.50	0.30	WTA1	11.00	9.00	60.00	20.00	0.50	2.38
WTA3	-53.00	1247.17	1250.00	37.70	81.00	61.00	43.00	34.00	28.00	WTA3	17.00	6.00	3.00	2.00	0.50	0.50	0.50	0.24	WTA3	9.00	9.00	73.00	9.00	0.50	2.47
WTA4	-53.00	56.67	70.71	35.60	95.00	71.00	50.00	42.00	36.00	WTA4	23.00	10.00	4.00	2.00	0.50	0.50	0.50	0.30	WTA4	4.00	0.50	82.00	14.00	0.50	2.40
WTA5	-52.50	1478.79	1470.54	38.20	82.00	67.00	50.00	42.00	36.00	WTA5	26.00	12.00	4.00	0.50	0.50	0.50	0.50	0.29	WTA5	8.00	7.00	69.00	16.00	0.50	2.48
WTA6	-52.00	370.34	364.01	35.90	91.00	76.00	61.00	53.00	45.00	WTA6	28.00	8.00	2.00	0.50	0.50	0.50	0.50	0.49	WTA6	7.00	0.50	79.00	14.00	0.50	2.38
WTA7	-53.00	299.70	304.14	44.70	62.00	34.00	27.00	26.00	25.00	WTA7	22.00	17.00	11.00	2.00	0.50	0.50	0.50	0.11	WTA7	16.00	14.00	52.00	18.00	0.50	2.42
WTA8	-52.00	677.98	1060.66	39.50	89.00	69.00	48.00	40.00	33.00	WTA8	23.00	12.00	6.00	3.00	0.50	0.50	0.50	0.29	WTA8	3.00	0.50	82.00	15.00	0.50	2.42
WTA9	-53.00	127.23	141.42	34.60	87.00	70.00	57.00	52.00	46.00	WTA9	34.00	18.00	10.00	3.00	0.50	0.50	0.50	0.48	WTA9	10.00	3.00	64.00	23.00	0.50	2.34
WTA10	-53.00	327.14	316.23	38.20	77.00	59.00	44.00	38.00	33.00	WTA10	23.00	10.00	5.00	0.50	0.50	0.50	0.50	0.24	WTA10	12.00	9.00	65.00	14.00	0.50	2.36
WTA11	-53.00	143.75	150.00	35.90	86.00	72.00	56.00	46.00	37.00	WTA11	23.00	9.00	6.00	3.00	0.50	0.50	0.50	0.38	WTA11	9.00	5.00	73.00	13.00	0.50	2.44
WTA12	-49.00	327.40	1274.75	35.70	87.00	62.00	35.00	29.00	25.00	WTA12	20.00	14.00	11.00	8.00	0.50	0.50	0.50	0.22	WTA12	7.00	0.50	77.00	16.00	0.50	2.33
WTA13	-53.00	110.09	100.00	38.70	78.00	63.00	51.00	45.00	39.00	WTA13	28.00	11.00	3.00	0.50	0.50	0.50	0.50	0.32	WTA13	10.00	9.00	65.00	16.00	0.50	2.43
WTA14	-53.00	103.97	100.00	35.20	91.00	76.00	61.00	53.00	46.00	WTA14	34.00	17.00	8.00	2.00	0.50	0.50	0.50	0.50	WTA14	2.00	0.50	76.00	22.00	0.50	2.44
WTA15	-53.00	365.37	380.79	38.80	89.00	71.00	52.00	44.00	38.00	WTA15	26.00	14.00	10.00	8.00	0.50	0.50	0.50	0.33	WTA15	7.00	0.50	76.00	17.00	0.50	2.34
WTA16	-53.00	111.63	111.80	35.80	89.00	79.00	61.00	49.00	38.00	WTA16	21.00	7.00	2.00	1.00	0.50	0.50	0.50	0.42	WTA16	9.00	1.00	79.00	11.00	0.50	2.46
WTA17	-52.00	455.31	452.77	35.70	93.00	83.00	65.00	55.00	46.00	WTA17	30.00	14.00	9.00	8.00	0.50	0.50	0.50	0.52	WTA17	6.00	0.50	75.00	19.00	0.50	2.34
WTA18	-53.00	403.28	412.31	37.20	84.00	67.00	50.00	42.00	34.00	WTA18	21.00	8.00	3.00	1.00	0.50	0.50	0.50	0.30	WTA18	11.00	5.00	72.00	12.00	0.50	2.38
WTA19	-49.00	596.24	585.23	37.80	86.00	74.00	60.00	53.00	47.00	WTA19	34.00	13.00	7.00	5.00	0.50	0.50	0.50	0.51	WTA19	10.00	4.00	67.00	19.00	0.50	2.43
WTA20	-53.00	946.99	961.77	32.90	89.00	72.00	52.00	45.00	39.00	WTA20	29.00	13.00	9.00	6.00	0.50	0.50	0.50	0.34	WTA20	10.00	0.50	72.00	18.00	0.50	2.37
WTA21	-53.00	197.17	206.16	38.60	78.00	58.00	45.00	40.00	35.00	WTA21	25.00	12.00	6.00	2.00	0.50	0.50	0.50	0.24	WTA21	11.00	9.00	64.00	16.00	0.50	2.44
WTA22	-52.00	1182.60	1653.03	37.70	74.00	51.00	36.00	31.00	28.00	WTA22	21.00	11.00	5.00	2.00	0.50	0.50	0.50	0.16	WTA22	13.00	12.00	61.00	14.00	0.50	2.38
WTA23	-52.00	325.58	335.41	41.10	82.00	62.00	47.00	43.00	40.00	WTA23	35.00	25.00	21.00	16.00	0.50	0.50	0.50	0.27	WTA23	7.00	7.00	58.00	28.00	0.50	2.36
WTA24	-53.00	1421.79	1431.78	36.80	89.00	72.00	50.00	42.00	35.00	WTA24	24.00	9.00	3.00	1.00	0.50	0.50	0.50	0.30	WTA24	5.00	0.50	81.00	14.00	0.50	2.34
WTA25	-53.00	66.14	70.71	37.10	96.00	87.00	76.00	72.00	67.00	WTA25	56.00	37.00	23.00	12.00	0.50	0.50	0.50	1.55	WTA25	4.00	0.50	53.00	43.00	0.50	2.49
WTA37	-49.00	596.24	585.23	38.40	72.00	49.00	32.00	25.00	21.00	WTA37	14.00	7.00	5.00	2.00	0.50	0.50	0.50	0.15	WTA37	12.00	13.00	66.00	9.00	0.50	2.43
WTA38	-49.00	596.24	585.23	36.90	77.00	56.00	41.00	36.00	32.00	WTA38	24.00	14.00	9.00	4.00	0.50	0.50	0.50	0.21	WTA38	12.00	11.00	60.00	17.00	0.50	2.42
WTA39	-52.00	455.31	452.77	37.30	93.00	80.00	62.00	52.00	44.00	WTA39	31.00	12.00	6.00	3.00	0.50	0.50	0.50	0.47	WTA39	6.00	0.50	76.00	18.00	0.50	2.38
WTA40	-52.00	455.31	452.77	35.50	90.00	75.00	50.00	40.00	32.00	WTA40	19.00	6.00	2.00	0.50	0.50	0.50	0.50	0.30	WTA40	8.00	0.50	82.00	10.00	0.50	2.38
WTA41	-53.00	1421.79	1431.78	38.10	88.00	68.00	47.00	40.00	34.00	WTA41	24.00	10.00	3.00	0.50	0.50	0.50	0.50	0.28	WTA41	5.00	0.50	81.00	14.00	0.50	2.35
WTA42	-53.00	1421.79	1431.78	38.70	86.00	68.00	49.00	43.00	38.00	WTA42	29.00	16.00	8.00	4.00	0.50	0.50	0.50	0.29	WTA42	9.00	0.50	71.00	20.00	0.50	2.37

SampleID_	MedianPS	Nitrite + Ni	Total Kjelda	Total Nitrog	Total Phosp	Total Organ	Total Carbo	Total Inorganic Carbon
WTA1	0.3	0.2	580	580	337	0.38	10.8	10.4
WTA3	0.242	0.1	610	610	409	0.37	10.9	10.5
WTA4	0.3	0.2	410	410	452	0.31	10.6	10.3
WTA5	0.292	0.2	680	680	374	0.36	10.8	10.4
WTA6	0.491	0.1	730	730	449	0.31	11	10.7
WTA7	0.107	0.2	1170	1170	554	0.73	10.8	10.1
WTA8	0.286	0.2	660	660	420	0.5	11	10.5
WTA9	0.483	0.2	510	510	438	0.37	11	10.6
WTA10	0.24	0.2	670	670	452	0.42	10.8	10.4
WTA11	0.375	0.2	610	610	409	0.41	10.7	10.3
WTA12	0.217	0.2	520	520	378	0.32	11	10.7
WTA13	0.321	0.2	760	760	448	0.54	11.1	10.6
WTA14	0.5	0.1	490	490	410	0.26	11	10.7
WTA15	0.331	0.2	810	810	451	0.41	10.8	10.4
WTA16	0.415	0.3	500	500	439	0.28	10.8	10.5
WTA17	0.522	0.2	420	420	338	0.31	11.2	10.9
WTA18	0.3	0.2	740	740	434	0.38	11.1	10.7
WTA19	0.513	0.2	740	740	453	0.43	11	10.6
WTA20	0.336	0.2	550	550	387	0.41	11	10.6
WTA21	0.242	0.2	1220	1220	543	0.65	11.2	10.6
WTA22	0.16	0.2	800	800	459	0.44	10.7	10.3
WTA23	0.27	0.2	960	960	493	0.57	10.9	10.3
WTA24	0.3	0.2	640	640	397	0.46	10.9	10.4
WTA25	1.553	0.2	390	390	343	0.28	10.9	10.6
WTA37	0.147	0.2	850	850	454	0.44	11	10.6
WTA38	0.21	0.1	740	740	420	0.49	11	10.5
WTA39	0.469	0.2	920	920	466	0.4	11	10.6
WTA40	0.3	0.2	770	770	440	0.38	10.9	10.5
WTA41	0.279	0.2	590	590	406	0.44	11	10.6
WTA42	0.292	0.2	630	630	434	0.48	10.9	10.4

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluc	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiPe	DibenzahA	Indeno1.2.	Coronene	PAHsum
HLA1	0.13	2.5	2.5	2	2	2	2	2	2	2	HLA1	0.13	2	2	2	2	2	2	2	HLA1	0.13	2	2	2	2.5	2
HLA2	0.12	2.5	2.5	2	2	2	2	2	2	2	HLA2	0.12	2	2	2	2	2	2	2	HLA2	0.12	2	2	2	2.5	2
HLA3	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA3	0.14	NA	NA	NA	NA	NA	NA	NA	HLA3	0.14	NA	NA	NA	NA	NA
HLA4	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA4	0.12	NA	NA	NA	NA	NA	NA	NA	HLA4	0.12	NA	NA	NA	NA	NA
HLA5	0.15	2.5	2.5	2	2	2	2	2	2	2	HLA5	0.15	2	2	2	2	2	2	2	HLA5	0.15	2	2	2	2.5	2
HLA6	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA6	0.13	NA	NA	NA	NA	NA	NA	NA	HLA6	0.13	NA	NA	NA	NA	NA
HLA7	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA7	0.11	NA	NA	NA	NA	NA	NA	NA	HLA7	0.11	NA	NA	NA	NA	NA
HLA8	0.13	2.5	2.5	2	2	2	2	2	2	2	HLA8	0.13	2	2	2	2	2	2	2	HLA8	0.13	2	2	2	2.5	2
HLA9	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA9	0.11	NA	NA	NA	NA	NA	NA	NA	HLA9	0.11	NA	NA	NA	NA	NA
HLA10	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA10	0.12	NA	NA	NA	NA	NA	NA	NA	HLA10	0.12	NA	NA	NA	NA	NA
HLA11	0.13	2.5	2.5	2	2	2	2	2	2	2	HLA11	0.13	2	2	2	2	2	2	2	HLA11	0.13	2	2	2	2.5	2
HLA12	0.13	2.5	2.5	2	2	2	2	2	2	2	HLA12	0.13	2	2	2	2	2	2	2	HLA12	0.13	2	2	2	2.5	2
HLA13	0.11	2.5	2.5	2	2	2	2	2	2	2	HLA13	0.11	2	2	2	2	2	2	2	HLA13	0.11	2	2	2	2.5	2
HLA15	0.14	2.5	2.5	2	2	2	2	2	2	2	HLA15	0.14	2	2	2	2	2	2	2	HLA15	0.14	2	2	2	2.5	2
HLA16	0.12	2.5	2.5	2	2	2	2	2	2	2	HLA16	0.12	2	2	2	2	2	2	2	HLA16	0.12	2	2	2	2.5	2
HLA17	0.16	2.5	2.5	2	2	2	2	2	2	2	HLA17	0.16	2	2	2	2	2	2	2	HLA17	0.16	2	2	2	2.5	2
HLA18	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA18	0.17	NA	NA	NA	NA	NA	NA	NA	HLA18	0.17	NA	NA	NA	NA	NA
HLA19	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA19	0.12	NA	NA	NA	NA	NA	NA	NA	HLA19	0.12	NA	NA	NA	NA	NA
HLA20	0.11	2.5	2.5	2	2	2	2	2	2	2	HLA20	0.11	2	2	2	2	2	2	2	HLA20	0.11	2	2	2	2.5	2
HLA21	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA21	0.15	NA	NA	NA	NA	NA	NA	NA	HLA21	0.15	NA	NA	NA	NA	NA
HLA22	0.13	2.5	2.5	2	2	2	2	2	2	2	HLA22	0.13	2	2	2	2	2	2	2	HLA22	0.13	2	2	2	2.5	2
HLA23	0.18	2.5	2.5	2	2	2	2	2	2	2	HLA23	0.18	2	2	2	2	2	2	2	HLA23	0.18	2	2	2	2.5	2
HLA24	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA24	0.13	NA	NA	NA	NA	NA	NA	NA	HLA24	0.13	NA	NA	NA	NA	NA
HLA25	0.12	2.5	2.5	2	2	2	2	2	2	2	HLA25	0.12	2	2	2	2	2	2	2	HLA25	0.12	2	2	2	2.5	2
HLA33	0.14	2.5	2.5	2	2	2	2	2	2	2	HLA33	0.14	2	2	2	2	2	2	2	HLA33	0.14	2	2	2	2.5	2
HLA37	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA37	0.14	NA	NA	NA	NA	NA	NA	NA	HLA37	0.14	NA	NA	NA	NA	NA
HLA38	0.14	2.5	2.5	2	2	2	2	2	2	2	HLA38	0.14	2	2	2	2	2	2	2	HLA38	0.14	2	2	2	2.5	2
HLA39	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA39	0.12	NA	NA	NA	NA	NA	NA	NA	HLA39	0.12	NA	NA	NA	NA	NA
HLA40	0.14	2.5	2.5	2	2	2	2	2	2	2	HLA40	0.14	2	2	2	2	2	2	2	HLA40	0.14	2	2	2	2.5	2

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2	Coronene	PAHsum
HLA1	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA1	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA1	0.13	15.38	15.38	15.38	19.23	15.38
HLA2	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67	HLA2	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67	HLA2	0.12	16.67	16.67	16.67	20.83	16.67
HLA3	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA3	0.14	NA	NA	NA	NA	NA	NA	NA	HLA3	0.14	NA	NA	NA	NA	NA
HLA4	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA4	0.12	NA	NA	NA	NA	NA	NA	NA	HLA4	0.12	NA	NA	NA	NA	NA
HLA5	0.15	16.67	16.67	13.33	13.33	13.33	13.33	13.33	13.33	13.33	HLA5	0.15	13.33	13.33	13.33	13.33	13.33	13.33	13.33	HLA5	0.15	13.33	13.33	13.33	16.67	13.33
HLA6	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA6	0.13	NA	NA	NA	NA	NA	NA	NA	HLA6	0.13	NA	NA	NA	NA	NA
HLA7	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA7	0.11	NA	NA	NA	NA	NA	NA	NA	HLA7	0.11	NA	NA	NA	NA	NA
HLA8	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA8	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA8	0.13	15.38	15.38	15.38	19.23	15.38
HLA9	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA9	0.11	NA	NA	NA	NA	NA	NA	NA	HLA9	0.11	NA	NA	NA	NA	NA
HLA10	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA10	0.12	NA	NA	NA	NA	NA	NA	NA	HLA10	0.12	NA	NA	NA	NA	NA
HLA11	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA11	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA11	0.13	15.38	15.38	15.38	19.23	15.38
HLA12	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA12	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA12	0.13	15.38	15.38	15.38	19.23	15.38
HLA13	0.11	22.73	22.73	18.18	18.18	18.18	18.18	18.18	18.18	18.18	HLA13	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18	HLA13	0.11	18.18	18.18	18.18	22.73	18.18
HLA15	0.14	17.86	17.86	14.29	14.29	14.29	14.29	14.29	14.29	14.29	HLA15	0.14	14.29	14.29	14.29	14.29	14.29	14.29	14.29	HLA15	0.14	14.29	14.29	14.29	17.86	14.29
HLA16	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67	HLA16	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67	HLA16	0.12	16.67	16.67	16.67	20.83	16.67
HLA17	0.16	15.63	15.63	12.50	12.50	12.50	12.50	12.50	12.50	12.50	HLA17	0.16	12.50	12.50	12.50	12.50	12.50	12.50	12.50	HLA17	0.16	12.50	12.50	12.50	15.63	12.50
HLA18	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA18	0.17	NA	NA	NA	NA	NA	NA	NA	HLA18	0.17	NA	NA	NA	NA	NA
HLA19	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA19	0.12	NA	NA	NA	NA	NA	NA	NA	HLA19	0.12	NA	NA	NA	NA	NA
HLA20	0.11	22.73	22.73	18.18	18.18	18.18	18.18	18.18	18.18	18.18	HLA20	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18	HLA20	0.11	18.18	18.18	18.18	22.73	18.18
HLA21	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA21	0.15	NA	NA	NA	NA	NA	NA	NA	HLA21	0.15	NA	NA	NA	NA	NA
HLA22	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA22	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	HLA22	0.13	15.38	15.38	15.38	19.23	15.38
HLA23	0.18	13.89	13.89	11.11	11.11	11.11	11.11	11.11	11.11	11.11	HLA23	0.18	11.11	11.11	11.11	11.11	11.11	11.11	11.11	HLA23	0.18	11.11	11.11	11.11	13.89	11.11
HLA24	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA24	0.13	NA	NA	NA	NA	NA	NA	NA	HLA24	0.13	NA	NA	NA	NA	NA
HLA25	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67	HLA25	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67	HLA25	0.12	16.67	16.67	16.67	20.83	16.67
HLA33	0.14	17.86	17.86	14.29	14.29	14.29	14.29	14.29	14.29	14.29	HLA33	0.14	14.29	14.29	14.29	14.29	14.29	14.29	14.29	HLA33	0.14	14.29	14.29	14.29	17.86	14.29
HLA37	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA37	0.14	NA	NA	NA	NA	NA	NA	NA	HLA37	0.14	NA	NA	NA	NA	NA
HLA38	0.14	17.86	17.86	14.29	14.29	14.29	14.29	14.29	14.29	14.29	HLA38	0.14	14.29	14.29	14.29	14.29	14.29	14.29	14.29	HLA38	0.14	14.29	14.29	14.29	17.86	14.29
HLA39	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	HLA39	0.12	NA	NA	NA	NA	NA	NA	NA	HLA39	0.12	NA	NA	NA	NA	NA
HLA40	0.14	17.86	17.86	14.29	14.29	14.29	14.29	14.29	14.29	14.29	HLA40	0.14	14.29	14.29	14.29	14.29	14.29	14.29	14.29	HLA40	0.14	14.29	14.29	14.29	17.86	14.29

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	SampleID_	Lead	Manganese	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	Methyl me	GrossAlpha	GrossBeta
HLA1	520	3630	5	0.25	12.7	0.05	11.9	0.5	0.25	HLA1	1.9	49	1.3	0.05	0.05	16	6.6	0.005	NA	NA	NA
HLA2	680	4570	5	0.55	13.8	0.05	12.8	4.7	0.5	HLA2	4.5	49	1.6	0.1	0.05	17.4	43.6	0.005	NA	NA	NA
HLA3	580	3260	5	0.25	9.13	0.05	9.6	0.5	0.25	HLA3	0.5	42	2.5	0.1	0.05	13.7	2.3	0.005	NA	NA	NA
HLA4	530	3610	5	0.25	12.6	0.05	11.5	0.5	0.25	HLA4	1	49	1.2	0.05	0.05	15.1	2.2	0.005	NA	NA	NA
HLA5	610	4650	5	0.25	10.6	0.05	11.2	8.8	0.8	HLA5	9	48	3.5	0.05	0.05	17	83.4	0.005	NA	250	250
HLA6	720	4600	5	0.25	13.7	0.05	11.9	0.5	0.25	HLA6	1.1	53	1.2	0.05	0.05	16.3	2.4	0.005	NA	NA	NA
HLA7	660	4130	5	0.55	12.2	0.05	12.2	1.9	0.25	HLA7	1.9	50	1.4	0.1	0.05	15.4	5.6	0.005	NA	250	250
HLA8	650	4160	5	0.25	12.9	0.05	11.8	0.5	0.25	HLA8	1.3	46	1.4	0.1	0.05	15.9	3	0.005	NA	NA	NA
HLA9	680	4220	5	0.25	13	0.05	11.8	0.5	0.25	HLA9	1.5	50	1.4	0.05	0.05	16.3	5.4	0.005	NA	NA	NA
HLA10	520	3120	5	0.25	8.18	0.05	8.9	0.5	0.25	HLA10	1.4	46	3.2	0.05	0.05	12.8	10.7	0.005	NA	NA	NA
HLA11	710	4020	5	0.25	11.6	0.05	10.9	0.5	0.25	HLA11	1.2	45	1.4	0.05	0.05	14.3	2.8	0.005	NA	NA	NA
HLA12	560	3750	5	0.25	9.67	0.05	10.7	1.2	0.25	HLA12	1.9	37	0.5	0.05	0.05	12.6	10.8	0.005	NA	250	250
HLA13	550	3660	5	0.51	11.8	0.05	11	0.5	0.25	HLA13	1.1	49	1.2	0.05	0.05	14.8	2.2	0.005	NA	NA	NA
HLA15	650	4540	5	0.55	12.4	0.05	12.5	4.1	0.5	HLA15	4	58	1.5	0.1	0.05	16.6	42.2	0.005	NA	250	510
HLA16	710	5580	5	0.25	10.9	0.1	11.5	1.8	0.25	HLA16	3.3	47	3	0.05	0.05	19	25.9	0.08	0.05	250	250
HLA17	700	3970	5	0.25	12.6	0.05	11.9	0.5	0.25	HLA17	1.1	50	1.3	0.1	0.05	16	2.4	0.005	NA	NA	NA
HLA18	700	4120	5	0.53	12.1	0.05	11.5	0.5	0.25	HLA18	1.3	45	1.5	0.05	0.05	15.7	2.5	0.005	NA	NA	NA
HLA19	650	4260	5	0.25	12.7	0.05	11.4	0.5	0.25	HLA19	1.1	46	1.3	0.05	0.05	16.4	3.3	0.005	NA	NA	NA
HLA20	560	4440	5	0.51	9.89	0.05	10.7	17	0.8	HLA20	13.1	44	2.5	0.05	0.05	15.4	167	0.005	NA	250	250
HLA21	550	3460	5	0.25	10.6	0.05	9.7	0.5	0.25	HLA21	0.5	44	1.2	0.1	0.05	13.4	1.9	0.005	NA	NA	NA
HLA22	560	3690	5	0.25	11.4	0.2	10.3	1.3	0.25	HLA22	1.9	51	1.6	0.2	0.05	14.1	18.3	0.005	NA	250	250
HLA23	620	12700	5	0.51	13.2	0.05	12.1	0.5	0.7	HLA23	1.5	90	2.6	0.1	0.05	16.9	12	0.005	NA	NA	NA
HLA24	600	3640	5	0.25	9.72	0.05	10	1.3	0.25	HLA24	1.7	50	2.4	0.05	0.1	15.6	9.2	0.005	NA	250	250
HLA25	680	3920	5	0.25	11.3	0.05	10.8	0.5	0.25	HLA25	0.5	47	2.6	0.05	0.05	16.7	2.9	0.005	NA	NA	NA
HLA33	550	3480	5	0.25	10.6	0.05	10	0.5	0.25	HLA33	1	41	1.2	0.05	0.05	12.8	2.3	0.005	NA	NA	NA
HLA37	750	4440	5	0.25	14.1	0.05	11.7	0.5	0.25	HLA37	1.1	57	1.5	0.1	0.05	17.6	2.6	0.005	NA	NA	NA
HLA38	650	4090	5	0.55	12.4	0.05	11.7	0.5	0.25	HLA38	1.2	46	1.4	0.05	0.05	15.9	2.2	0.005	NA	NA	NA
HLA39	660	4680	5	0.53	9.93	0.05	11.4	16.2	0.8	HLA39	11.3	46	2.4	0.05	0.05	15.2	138	0.005	NA	250	250
HLA40	510	3450	5	0.25	8.04	0.05	9	6	0.25	HLA40	4.6	40	1.7	0.05	0.05	13.3	57.3	0.005	NA	250	250

SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plu	PS2360plu	PS4750plu	PS9500plu	PS19000pl	PS37500pl	PS75000pl	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
HLA1	-75.75	476.90	471.70	22.90	99.00	99.00	79.00	49.00	28.00	HLA1	10.00	3.00	0.50	0.50	0.50	0.50	0.50	0.42	HLA1	1.00	0.50	94.00	5.00	0.50	2.65
HLA2	-71.75	560.43	1051.19	24.50	98.00	98.00	85.00	60.00	39.00	HLA2	13.00	4.00	1.00	0.50	0.50	0.50	0.50	0.51	HLA2	2.00	0.50	92.00	6.00	0.50	2.63
HLA3	-74.50	320.34	316.23	25.30	98.00	97.00	56.00	29.00	16.00	HLA3	6.00	3.00	0.50	0.50	0.50	0.50	0.50	0.33	HLA3	2.00	0.50	94.00	4.00	0.50	2.64
HLA4	-74.50	519.76	509.90	22.80	99.00	99.00	86.00	59.00	35.00	HLA4	13.00	4.00	1.00	0.50	0.50	0.50	0.50	0.49	HLA4	1.00	0.50	92.00	7.00	0.50	2.65
HLA5	-73.25	51.92	50.00	23.00	98.00	97.00	84.00	62.00	45.00	HLA5	23.00	10.00	2.00	0.50	0.50	0.50	0.50	0.55	HLA5	2.00	0.50	84.00	14.00	0.50	2.62
HLA6	-74.50	328.07	320.16	22.00	99.00	99.00	82.00	53.00	32.00	HLA6	10.00	2.00	0.50	0.50	0.50	0.50	0.50	0.45	HLA6	1.00	0.50	95.00	4.00	0.50	2.64
HLA7	-74.50	148.78	141.42	20.60	99.00	98.00	75.00	51.00	34.00	HLA7	18.00	9.00	5.00	3.00	0.50	0.50	0.50	0.44	HLA7	1.00	0.50	87.00	12.00	0.50	2.67
HLA8	-75.75	764.95	782.62	23.10	99.00	99.00	76.00	47.00	26.00	HLA8	7.00	2.00	0.50	0.50	0.50	0.50	0.50	0.41	HLA8	1.00	0.50	96.00	3.00	0.50	2.65
HLA9	-73.25	208.57	200.00	20.70	99.00	98.00	71.00	45.00	30.00	HLA9	14.00	6.00	3.00	1.00	0.50	0.50	0.50	0.40	HLA9	1.00	0.50	91.00	8.00	0.50	2.69
HLA10	-74.50	235.27	223.61	24.20	98.00	96.00	71.00	46.00	32.00	HLA10	17.00	8.00	4.00	0.50	0.50	0.50	0.50	0.41	HLA10	2.00	0.50	87.00	11.00	0.50	2.59
HLA11	-73.00	1144.36	1131.37	22.70	98.00	96.00	65.00	43.00	31.00	HLA11	15.00	7.00	2.00	0.50	0.50	0.50	0.50	0.39	HLA11	2.00	0.50	89.00	9.00	0.50	2.66
HLA12	-73.25	95.59	100.00	21.70	97.00	97.00	81.00	58.00	41.00	HLA12	21.00	9.00	5.00	0.50	0.50	0.50	0.50	0.51	HLA12	3.00	0.50	84.00	13.00	0.50	2.61
HLA13	-74.50	415.77	412.31	21.60	99.00	99.00	87.00	59.00	34.00	HLA13	10.00	3.00	0.50	0.50	0.50	0.50	0.50	0.49	HLA13	1.00	0.50	94.00	5.00	0.50	2.65
HLA15	-73.25	139.64	150.00	23.10	97.00	96.00	78.00	56.00	41.00	HLA15	26.00	17.00	12.00	8.00	0.50	0.50	0.50	0.50	HLA15	2.00	0.50	79.00	19.00	0.50	2.62
HLA16	-73.25	74.36	70.71	22.80	99.00	97.00	80.00	61.00	47.00	HLA16	31.00	19.00	10.00	0.50	0.50	0.50	0.50	0.56	HLA16	1.00	0.50	76.00	23.00	0.50	2.63
HLA17	-74.50	1192.16	1188.49	24.40	98.00	98.00	82.00	53.00	34.00	HLA17	13.00	5.00	1.00	0.50	0.50	0.50	0.50	0.45	HLA17	1.00	0.50	92.00	7.00	0.50	2.58
HLA18	-73.25	135.12	939.41	23.60	98.00	96.00	78.00	55.00	36.00	HLA18	15.00	5.00	0.50	0.50	0.50	0.50	0.50	0.47	HLA18	2.00	0.50	90.00	8.00	0.50	2.58
HLA19	-74.50	360.90	353.55	23.20	99.00	99.00	77.00	46.00	27.00	HLA19	9.00	2.00	0.50	0.50	0.50	0.50	0.50	0.41	HLA19	1.00	0.50	95.00	4.00	0.50	2.59
HLA20	-73.25	83.47	70.71	21.90	99.00	99.00	78.00	55.00	38.00	HLA20	16.00	5.00	0.50	0.50	0.50	0.50	0.50	0.48	HLA20	1.00	0.50	91.00	8.00	0.50	2.62
HLA21	-76.00	1218.09	1209.34	22.70	99.00	98.00	79.00	46.00	24.00	HLA21	7.00	2.00	0.50	0.50	0.50	0.50	0.50	0.41	HLA21	1.00	0.50	96.00	3.00	0.50	2.63
HLA22	-74.50	151.41	150.00	21.50	97.00	96.00	77.00	56.00	42.00	HLA22	21.00	10.00	4.00	0.50	0.50	0.50	0.50	0.50	HLA22	3.00	0.50	84.00	13.00	0.50	2.63
HLA23	-73.25	219.30	223.61	24.20	97.00	95.00	75.00	50.00	33.00	HLA23	16.00	8.00	6.00	5.00	0.50	0.50	0.50	0.43	HLA23	3.00	0.50	86.00	11.00	0.50	2.61
HLA24	-74.50	107.60	100.00	23.40	99.00	98.00	79.00	54.00	36.00	HLA24	15.00	4.00	0.50	0.50	0.50	0.50	0.50	0.46	HLA24	1.00	0.50	92.00	7.00	0.50	2.58
HLA25	-75.00	529.97	1835.76	24.60	99.00	98.00	77.00	51.00	32.00	HLA25	11.00	3.00	0.50	0.50	0.50	0.50	0.50	0.43	HLA25	1.00	0.50	93.00	6.00	0.50	2.57
HLA33	-75.00	1333.48	1323.82	20.90	98.00	96.00	78.00	55.00	36.00	HLA33	14.00	4.00	0.50	0.50	0.50	0.50	0.50	0.47	HLA33	2.00	0.50	91.00	7.00	0.50	2.63
HLA37	-75.00	1333.48	1323.82	21.30	97.00	95.00	75.00	53.00	36.00	HLA37	18.00	7.00	2.00	0.50	0.50	0.50	0.50	0.46	HLA37	3.00	0.50	86.00	11.00	0.50	2.63
HLA38	-75.00	1333.48	1323.82	29.30	98.00	96.00	78.00	54.00	36.00	HLA38	15.00	5.00	0.50	0.50	0.50	0.50	0.50	0.46	HLA38	2.00	0.50	90.00	8.00	0.50	2.62
HLA39	-73.25	83.47	70.71	24.90	99.00	99.00	82.00	61.00	44.00	HLA39	22.00	9.00	3.00	0.50	0.50	0.50	0.50	0.54	HLA39	1.00	0.50	86.00	13.00	0.50	2.64
HLA40	-73.25	83.47	70.71	17.80	99.00	99.00	82.00	62.00	45.00	HLA40	22.00	8.00	0.50	0.50	0.50	0.50	0.50	0.55	HLA40	1.00	0.50	87.00	12.00	0.50	2.62

SampleID_	MedianPS	Nitrite + Ni	Total Kjeld	Total Nitro	Total Phos	Total Orgar	Total Carbo	Total Inorganic Carbon		
HLA1	0.421	0.2	90	90	418	0.13	7.85	7.72		
HLA2	0.508	0.2	140	140	485	0.12	7.88	7.76		
HLA3	0.328	0.05	90	90	279	0.14	7.53	7.39		
HLA4	0.491	0.05	110	110	399	0.12	8.26	8.14		
HLA5	0.549	0.05	140	140	495	0.15	8.32	8.17		
HLA6	0.45	0.05	140	140	460	0.13	8.52	8.39		
HLA7	0.435	0.05	110	110	468	0.11	7.98	7.87		
HLA8	0.412	0.05	160	160	396	0.13	8.36	8.23		
HLA9	0.401	0.05	170	170	492	0.11	7.57	7.46		
HLA10	0.405	0.05	160	160	427	0.12	7.9	7.78		
HLA11	0.385	0.05	190	190	358	0.13	7.76	7.63		
HLA12	0.507	0.05	110	110	495	0.13	7.75	7.62		
HLA13	0.488	0.3	170	170	288	0.11	8.14	8.03		
HLA15	0.495	0.05	210	210	438	0.14	7.69	7.55		
HLA16	0.563	0.1	180	180	618	0.12	8.31	8.19		
HLA17	0.453	0.6	160	160	420	0.16	8.43	8.27		
HLA18	0.471	0.05	1050	1050	364	0.17	7.64	7.47		
HLA19	0.409	0.3	90	90	509	0.12	7.98	7.86		
HLA20	0.476	0.1	170	170	523	0.11	8.14	8.03		
HLA21	0.41	0.05	130	130	446	0.15	8.54	8.39		
HLA22	0.5	0.05	100	100	371	0.13	8.15	8.02		
HLA23	0.425	0.4	200	200	605	0.18	8.44	8.26		
HLA24	0.464	0.3	130	130	665	0.13	8.05	7.92		
HLA25	0.434	0.3	140	140	520	0.12	8.32	8.2		
HLA33	0.471	0.05	140	140	565	0.14	8.27	8.13		
HLA37	0.456	0.05	180	180	492	0.14	8.01	7.87		
HLA38	0.464	0.05	210	210	711	0.14	8.2	8.06		
HLA39	0.538	0.05	100	100	438	0.12	8.19	8.07		
HLA40	0.549	0.4	120	120	404	0.14	8.28	8.14		

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	BenzoghiPe	DibenzahA	Indeno1.2.	Coronene	PAHsum
KFA1	0.31	2.5	2.5	2	2	2	2	2	2	2	KFA1	2	2	2	2	2	2	2	KFA1	2	2	2	2.5	2
KFA2	0.16	2.5	2.5	2	2	2	2	2	2	2	KFA2	2	2	2	2	2	2	2	KFA2	2	2	2	2.5	2
KFA3	0.18	2.5	2.5	2	2	2	2	2	2	2	KFA3	2	2	2	2	2	2	2	KFA3	2	2	2	2.5	2
KFA4	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA4	NA	NA	NA	NA	NA	NA	NA	KFA4	NA	NA	NA	NA	NA
KFA5	0.21	2.5	2.5	2	2	2	2	2	2	2	KFA5	2	2	2	2	2	2	2	KFA5	2	2	2	2.5	2
KFA6	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA6	NA	NA	NA	NA	NA	NA	NA	KFA6	NA	NA	NA	NA	NA
KFA7	0.15	2.5	2.5	2	2	2	2	2	2	2	KFA7	2	2	2	2	2	2	2	KFA7	2	2	2	2.5	2
KFA8	0.22	2.5	2.5	2	2	2	2	2	2	2	KFA8	2	2	2	2	2	2	2	KFA8	2	2	2	2.5	2
KFA9	0.17	2.5	2.5	2	2	2	4	2	2	2	KFA9	2	2	2	2	2	2	2	KFA9	2	2	2	2.5	4
KFA10	0.19	2.5	2.5	2	2	2	2	2	2	2	KFA10	2	2	2	2	2	2	2	KFA10	2	2	2	2.5	2
KFA11	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA11	NA	NA	NA	NA	NA	NA	NA	KFA11	NA	NA	NA	NA	NA
KFA12	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA12	NA	NA	NA	NA	NA	NA	NA	KFA12	NA	NA	NA	NA	NA
KFA13	0.12	NA	2.5	2	2	2	2	2	2	2	KFA13	2	2	2	2	2	2	2	KFA13	2	2	2	2.5	2
KFA14	0.24	2.5	2.5	2	2	2	2	2	2	2	KFA14	2	2	2	2	2	2	2	KFA14	2	2	2	2.5	2
KFA15	0.21	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA15	NA	NA	NA	NA	NA	NA	NA	KFA15	NA	NA	NA	NA	NA
KFA16	0.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA16	NA	NA	NA	NA	NA	NA	NA	KFA16	NA	NA	NA	NA	NA
KFA17	0.16	NA	2.5	2	2	2	2	2	2	2	KFA17	2	2	2	2	2	2	2	KFA17	2	2	2	2.5	2
KFA18	0.2	2.5	2.5	2	2	2	2	2	2	2	KFA18	2	2	2	2	2	2	2	KFA18	2	2	2	2.5	2
KFA19	0.25	2.5	2.5	2	2	2	2	2	2	2	KFA19	2	2	2	2	2	2	2	KFA19	2	2	2	2.5	2
KFA20	0.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA20	NA	NA	NA	NA	NA	NA	NA	KFA20	NA	NA	NA	NA	NA
KFA21	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA21	NA	NA	NA	NA	NA	NA	NA	KFA21	NA	NA	NA	NA	NA
KFA22	0.22	2.5	2.5	2	2	2	2	2	2	2	KFA22	2	2	2	2	2	2	2	KFA22	2	2	2	2.5	2
KFA23	0.17	2.5	2.5	2	2	2	2	2	2	2	KFA23	2	2	2	2	2	2	2	KFA23	2	2	2	2.5	2
KFA24	0.16	2.5	2.5	2	2	2	2	2	2	2	KFA24	2	2	2	2	2	2	2	KFA24	2	2	2	2.5	2
KFA37	0.23	2.5	2.5	2	2	2	2	2	2	2	KFA37	2	2	2	2	2	2	2	KFA37	2	2	2	2.5	2
KFA38	0.23	2.5	2.5	2	2	2	2	2	2	2	KFA38	2	2	2	2	2	2	2	KFA38	2	2	2	2.5	2
KFA39	0.22	2.5	2.5	2	2	2	2	2	2	2	KFA39	2	2	2	2	2	2	2	KFA39	2	2	2	2.5	2
KFA40	0.24	2.5	2.5	2	2	2	2	2	2	2	KFA40	2	2	2	2	2	2	2	KFA40	2	2	2	2.5	2

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	DibenzahA	Indeno1.2	Coronene	PAHsum
KFA1	0.31	8.06	8.06	6.45	6.45	6.45	6.45	6.45	6.45	6.45	KFA1	6.45	6.45	6.45	6.45	6.45	6.45	6.45	KFA1	6.45	6.45	8.06	6.45
KFA2	0.16	15.63	15.63	12.50	12.50	12.50	12.50	12.50	12.50	12.50	KFA2	12.50	12.50	12.50	12.50	12.50	12.50	12.50	KFA2	12.50	12.50	15.63	12.50
KFA3	0.18	13.89	13.89	11.11	11.11	11.11	11.11	11.11	11.11	11.11	KFA3	11.11	11.11	11.11	11.11	11.11	11.11	11.11	KFA3	11.11	11.11	13.89	11.11
KFA4	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA4	NA	NA	NA	NA	NA	NA	NA	KFA4	NA	NA	NA	NA
KFA5	0.21	11.90	11.90	9.52	9.52	9.52	9.52	9.52	9.52	9.52	KFA5	9.52	9.52	9.52	9.52	9.52	9.52	9.52	KFA5	9.52	9.52	11.90	9.52
KFA6	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA6	NA	NA	NA	NA	NA	NA	NA	KFA6	NA	NA	NA	NA
KFA7	0.15	16.67	16.67	13.33	13.33	13.33	13.33	13.33	13.33	13.33	KFA7	13.33	13.33	13.33	13.33	13.33	13.33	13.33	KFA7	13.33	13.33	16.67	13.33
KFA8	0.22	11.36	11.36	9.09	9.09	9.09	9.09	9.09	9.09	9.09	KFA8	9.09	9.09	9.09	9.09	9.09	9.09	9.09	KFA8	9.09	9.09	11.36	9.09
KFA9	0.17	14.71	14.71	11.76	11.76	11.76	23.53	11.76	11.76	11.76	KFA9	11.76	11.76	11.76	11.76	11.76	11.76	11.76	KFA9	11.76	11.76	14.71	23.53
KFA10	0.19	13.16	13.16	10.53	10.53	10.53	10.53	10.53	10.53	10.53	KFA10	10.53	10.53	10.53	10.53	10.53	10.53	10.53	KFA10	10.53	10.53	13.16	10.53
KFA11	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA11	NA	NA	NA	NA	NA	NA	NA	KFA11	NA	NA	NA	NA
KFA12	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA12	NA	NA	NA	NA	NA	NA	NA	KFA12	NA	NA	NA	NA
KFA13	0.12	NA	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67	KFA13	16.67	16.67	16.67	16.67	16.67	16.67	16.67	KFA13	16.67	16.67	20.83	16.67
KFA14	0.24	10.42	10.42	8.33	8.33	8.33	8.33	8.33	8.33	8.33	KFA14	8.33	8.33	8.33	8.33	8.33	8.33	8.33	KFA14	8.33	8.33	10.42	8.33
KFA15	0.21	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA15	NA	NA	NA	NA	NA	NA	NA	KFA15	NA	NA	NA	NA
KFA16	0.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA16	NA	NA	NA	NA	NA	NA	NA	KFA16	NA	NA	NA	NA
KFA17	0.16	#VALUE!	15.63	12.50	12.50	12.50	12.50	12.50	12.50	12.50	KFA17	12.50	12.50	12.50	12.50	12.50	12.50	12.50	KFA17	12.50	12.50	15.63	12.50
KFA18	0.20	12.50	12.50	10.00	10.00	10.00	10.00	10.00	10.00	10.00	KFA18	10.00	10.00	10.00	10.00	10.00	10.00	10.00	KFA18	10.00	10.00	12.50	10.00
KFA19	0.25	10.00	10.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	KFA19	8.00	8.00	8.00	8.00	8.00	8.00	8.00	KFA19	8.00	8.00	10.00	8.00
KFA20	0.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA20	NA	NA	NA	NA	NA	NA	NA	KFA20	NA	NA	NA	NA
KFA21	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	KFA21	NA	NA	NA	NA	NA	NA	NA	KFA21	NA	NA	NA	NA
KFA22	0.22	11.36	11.36	9.09	9.09	9.09	9.09	9.09	9.09	9.09	KFA22	9.09	9.09	9.09	9.09	9.09	9.09	9.09	KFA22	9.09	9.09	11.36	9.09
KFA23	0.17	14.71	14.71	11.76	11.76	11.76	11.76	11.76	11.76	11.76	KFA23	11.76	11.76	11.76	11.76	11.76	11.76	11.76	KFA23	11.76	11.76	14.71	11.76
KFA24	0.16	15.63	15.63	12.50	12.50	12.50	12.50	12.50	12.50	12.50	KFA24	12.50	12.50	12.50	12.50	12.50	12.50	12.50	KFA24	12.50	12.50	15.63	12.50
KFA37	0.23	10.87	10.87	8.70	8.70	8.70	8.70	8.70	8.70	8.70	KFA37	8.70	8.70	8.70	8.70	8.70	8.70	8.70	KFA37	8.70	8.70	10.87	8.70
KFA38	0.23	10.87	10.87	8.70	8.70	8.70	8.70	8.70	8.70	8.70	KFA38	8.70	8.70	8.70	8.70	8.70	8.70	8.70	KFA38	8.70	8.70	10.87	8.70
KFA39	0.22	11.36	11.36	9.09	9.09	9.09	9.09	9.09	9.09	9.09	KFA39	9.09	9.09	9.09	9.09	9.09	9.09	9.09	KFA39	9.09	9.09	11.36	9.09
KFA40	0.24	10.42	10.42	8.33	8.33	8.33	8.33	8.33	8.33	8.33	KFA40	8.33	8.33	8.33	8.33	8.33	8.33	8.33	KFA40	8.33	8.33	10.42	8.33

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	SampleID_	Lead	Manganese	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	Methyl me	GrossAlpha	GrossBeta
KFA1	730	3620	10	0.25	8.18	0.1	8.8	0.5	0.25	KFA1	1.3	35	2	0.2	0.05	13.8	2.3	0.005	NA	NA	NA
KFA2	890	5910	10	1.05	13.5	0.1	15.6	0.5	0.25	KFA2	2	46	2.2	0.2	0.1	23.1	12.6	0.005	NA	250	250
KFA3	780	4790	5	0.78	11.2	0.05	12.8	0.5	0.25	KFA3	1.3	46	1.3	0.05	0.2	22.2	4.9	0.005	NA	1390	250
KFA4	720	3500	10	0.53	8.05	0.1	9.4	0.5	0.25	KFA4	1.3	37	1.6	0.1	0.05	13.6	2.1	0.005	NA	NA	NA
KFA5	810	4050	10	0.55	8.44	0.1	11.3	0.5	0.25	KFA5	1.4	37	1.9	0.05	0.05	18.6	3.3	0.005	NA	NA	NA
KFA6	720	3680	10	0.52	8.64	0.1	9.7	0.5	0.25	KFA6	1.5	40	1.6	0.1	0.05	14.2	2.5	0.005	NA	NA	NA
KFA7	910	6390	5	0.84	13.5	0.05	13.3	1.4	0.25	KFA7	2.1	44	1.7	0.1	0.05	23.7	16	0.005	NA	250	250
KFA8	640	3710	5	0.69	10.8	0.1	11.7	0.5	0.25	KFA8	1.2	40	1.4	0.1	0.05	17.6	2.4	0.005	NA	NA	NA
KFA9	870	5250	5	0.72	11.2	0.1	14	0.5	0.25	KFA9	7	50	1.7	0.1	0.05	24	10.5	0.005	NA	NA	NA
KFA10	1030	6250	30	0.82	13.9	0.1	15.6	0.5	0.5	KFA10	2.1	50	2.2	0.2	0.05	23.7	8.3	0.005	NA	NA	NA
KFA11	620	3170	5	0.25	6.29	0.1	7.9	0.5	0.25	KFA11	1.4	33	1.4	0.1	0.05	14.2	5.4	0.005	NA	NA	NA
KFA12	720	12700	5	0.94	8.89	0.2	13.9	0.5	0.6	KFA12	1.8	65	4.2	0.05	0.05	19.6	256	0.005	NA	250	250
KFA13	860	6890	5	0.83	13.2	0.05	12.3	2.6	0.25	KFA13	2.5	48	1.8	0.1	0.05	24	22.4	0.005	NA	250	250
KFA14	550	2950	5	0.25	7.8	0.05	9.3	0.5	0.25	KFA14	1.2	32	1.3	0.05	0.05	13.4	2.4	0.005	NA	NA	NA
KFA15	800	4380	5	0.64	9.74	0.05	11	0.5	0.25	KFA15	1.3	37	1.6	0.1	0.05	20.5	3	0.005	NA	NA	NA
KFA16	780	3830	5	0.61	8.89	0.1	12	0.5	0.25	KFA16	1.3	36	1.8	0.2	0.05	16.8	2.7	0.005	NA	NA	NA
KFA17	750	6080	5	0.77	12.2	0.05	11.3	1.2	0.25	KFA17	2.8	41	1.6	0.1	0.05	22.5	16	0.005	NA	250	250
KFA18	810	4500	5	0.58	9.25	0.1	11.4	0.5	0.25	KFA18	1.5	43	1.9	0.05	0.05	20.1	3.7	0.005	NA	NA	NA
KFA19	850	4120	10	0.66	8.67	0.1	11	0.5	0.25	KFA19	1.4	38	2	0.1	0.05	18.5	2.6	0.005	NA	NA	NA
KFA20	570	2760	5	0.25	5.31	0.05	7.8	0.5	0.25	KFA20	0.5	29	1.3	0.05	0.05	10.9	3.3	0.005	NA	NA	NA
KFA21	840	4730	10	0.78	9.55	0.1	12.8	0.5	0.25	KFA21	2	63	2.1	0.05	0.05	21.3	10	0.005	NA	NA	NA
KFA22	630	2950	10	0.25	8.05	0.1	10.6	0.5	0.25	KFA22	1.2	30	1.6	0.1	0.05	14.9	2.5	0.005	NA	NA	NA
KFA23	710	4010	5	0.64	8.59	0.05	10.7	0.5	0.25	KFA23	2	40	1.7	0.1	0.05	19.7	7.1	0.005	NA	660	250
KFA24	840	5140	5	0.73	11.9	0.1	13.4	0.5	0.25	KFA24	1.8	38	2	0.2	0.05	20.5	8.4	0.005	NA	250	250
KFA37	690	3700	5	0.61	9.57	0.05	10.9	0.5	0.25	KFA37	1.3	39	1.5	0.1	0.05	16.5	2.4	0.005	NA	NA	NA
KFA38	620	3260	10	0.54	7.93	0.05	9.8	0.5	0.25	KFA38	1.3	34	1.6	0.1	0.05	13.3	2.8	0.005	NA	NA	NA
KFA39	720	3880	10	0.54	8.8	0.1	10.5	0.5	0.25	KFA39	1.4	37	1.8	0.1	0.05	16.5	2.7	0.005	NA	NA	NA
KFA40	610	2930	10	0.52	7.24	0.1	9.4	0.5	0.25	KFA40	1.3	36	1.5	0.1	0.05	13.7	2.6	0.005	NA	NA	NA

SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plu	PS2360plu	PS4750plu	PS9500plu	PS19000p	PS37500p	PS75000p	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
KFA1	-76.00	1229.19	1209.34	36.80	92.00	83.00	53.00	41.00	31.00	KFA1	12.00	3.00	0.50	0.50	0.50	0.50	0.50	0.33	KFA1	8.00	0.50	86.00	6.00	0.50	2.61
KFA2	-75.25	114.41	70.71	29.20	96.00	93.00	75.00	61.00	46.00	KFA2	20.00	5.00	2.00	0.50	0.50	0.50	0.50	0.55	KFA2	4.00	0.50	86.00	10.00	0.50	2.54
KFA3	-75.00	157.72	141.42	28.00	98.00	94.00	68.00	52.00	38.00	KFA3	18.00	7.00	2.00	0.50	0.50	0.50	0.50	0.45	KFA3	2.00	0.50	88.00	10.00	0.50	2.55
KFA4	-76.00	1379.01	1346.29	32.50	95.00	85.00	50.00	37.00	26.00	KFA4	11.00	2.00	0.50	0.50	0.50	0.50	0.50	0.31	KFA4	5.00	0.50	90.00	5.00	0.50	2.53
KFA5	-75.50	421.65	412.31	35.80	94.00	85.00	47.00	33.00	23.00	KFA5	8.00	1.00	0.50	0.50	0.50	0.50	0.50	0.29	KFA5	6.00	0.50	91.00	3.00	0.50	2.50
KFA6	-75.50	846.51	832.17	29.70	95.00	85.00	48.00	35.00	26.00	KFA6	10.00	2.00	0.50	0.50	0.50	0.50	0.50	0.29	KFA6	5.00	0.50	90.00	5.00	0.50	2.49
KFA7	-75.25	45.89	50.00	29.90	97.00	95.00	76.00	61.00	47.00	KFA7	21.00	5.00	1.00	0.50	0.50	0.50	0.50	0.56	KFA7	3.00	0.50	88.00	9.00	0.50	2.57
KFA8	-75.25	1110.24	1092.02	29.10	96.00	90.00	62.00	47.00	34.00	KFA8	13.00	2.00	0.50	0.50	0.50	0.50	0.50	0.40	KFA8	3.00	0.50	91.00	6.00	0.50	2.60
KFA9	-75.75	196.70	180.28	29.70	96.00	92.00	60.00	42.00	29.00	KFA9	12.00	3.00	0.50	0.50	0.50	0.50	0.50	0.37	KFA9	2.00	0.50	92.00	6.00	0.50	2.47
KFA10	-75.25	272.06	250.00	28.70	95.00	85.00	47.00	33.00	23.00	KFA10	10.00	2.00	0.50	0.50	0.50	0.50	0.50	0.29	KFA10	5.00	0.50	91.00	4.00	0.50	2.57
KFA11	-75.75	492.29	471.70	39.70	96.00	85.00	49.00	35.00	25.00	KFA11	9.00	0.50	0.50	0.50	0.50	0.50	0.50	0.30	KFA11	5.00	0.50	92.00	3.00	0.50	2.46
KFA12	-75.25	158.41	141.42	24.00	97.00	91.00	55.00	40.00	28.00	KFA12	12.00	3.00	0.50	0.50	0.50	0.50	0.50	0.34	KFA12	3.00	0.50	91.00	6.00	0.50	2.53
KFA13	-75.25	45.89	50.00	29.50	96.00	95.00	83.00	73.00	61.00	KFA13	35.00	14.00	9.00	4.00	0.50	0.50	0.50	0.85	KFA13	4.00	0.50	75.00	21.00	0.50	2.57
KFA14	-75.50	698.33	680.07	30.20	95.00	88.00	52.00	38.00	28.00	KFA14	11.00	3.00	0.50	0.50	0.50	0.50	0.50	0.32	KFA14	5.00	0.50	90.00	5.00	0.50	2.46
KFA15	-75.50	338.01	320.16	33.90	95.00	85.00	46.00	33.00	24.00	KFA15	10.00	3.00	0.50	0.50	0.50	0.50	0.50	0.29	KFA15	5.00	0.50	90.00	5.00	0.50	2.45
KFA16	-75.75	931.02	1972.31	30.50	97.00	88.00	57.00	43.00	30.00	KFA16	12.00	4.00	2.00	1.00	0.50	0.50	0.50	0.36	KFA16	2.00	0.50	91.00	7.00	0.50	2.47
KFA17	-75.25	57.63	50.00	28.70	95.00	92.00	80.00	70.00	57.00	KFA17	37.00	22.00	16.00	9.00	0.50	0.50	0.50	0.80	KFA17	5.00	0.50	68.00	27.00	0.50	2.58
KFA18	-75.50	280.94	269.26	32.10	97.00	87.00	55.00	40.00	29.00	KFA18	13.00	4.00	0.50	0.50	0.50	0.50	0.50	0.34	KFA18	3.00	0.50	91.00	6.00	0.50	2.49
KFA19	-76.25	1964.02	1947.43	34.80	92.00	85.00	57.00	44.00	32.00	KFA19	13.00	3.00	0.50	0.50	0.50	0.50	0.50	0.37	KFA19	8.00	0.50	86.00	6.00	0.50	2.46
KFA20	-75.25	483.53	447.21	34.80	95.00	82.00	43.00	29.00	20.00	KFA20	7.00	0.50	0.50	0.50	0.50	0.50	0.50	0.27	KFA20	5.00	0.50	92.00	3.00	0.50	2.47
KFA21	-75.00	227.71	206.16	29.40	97.00	93.00	58.00	41.00	29.00	KFA21	13.00	4.00	0.50	0.50	0.50	0.50	0.50	0.36	KFA21	3.00	0.50	90.00	7.00	0.50	2.45
KFA22	-76.00	1551.00	1507.48	30.00	95.00	86.00	58.00	43.00	32.00	KFA22	13.00	3.00	0.50	0.50	0.50	0.50	0.50	0.37	KFA22	5.00	0.50	89.00	6.00	0.50	2.48
KFA23	-75.25	107.19	100.00	25.80	97.00	93.00	68.00	54.00	42.00	KFA23	25.00	11.00	0.50	0.50	0.50	0.50	0.50	0.48	KFA23	3.00	0.50	82.00	15.00	0.50	2.54
KFA24	-75.25	149.93	111.80	29.60	97.00	94.00	63.00	47.00	34.00	KFA24	13.00	2.00	0.50	0.50	0.50	0.50	0.50	0.40	KFA24	3.00	0.50	92.00	5.00	0.50	2.51
KFA37	-76.00	1229.19	1209.34	29.90	95.00	84.00	46.00	33.00	23.00	KFA37	8.00	1.00	0.50	0.50	0.50	0.50	0.50	0.28	KFA37	5.00	0.50	92.00	3.00	0.50	2.46
KFA38	-76.00	1229.19	1209.34	29.80	96.00	87.00	52.00	38.00	28.00	KFA38	11.00	2.00	0.50	0.50	0.50	0.50	0.50	0.31	KFA38	4.00	0.50	91.00	5.00	0.50	2.47
KFA39	-75.50	698.33	680.07	29.10	95.00	85.00	51.00	38.00	27.00	KFA39	11.00	2.00	0.50	0.50	0.50	0.50	0.50	0.31	KFA39	5.00	0.50	90.00	5.00	0.50	2.46
KFA40	-75.50	698.33	680.07	29.50	95.00	86.00	52.00	38.00	28.00	KFA40	12.00	3.00	0.50	0.50	0.50	0.50	0.50	0.32	KFA40	5.00	0.50	90.00	5.00	0.50	2.54

SampleID_	MedianPS	Nitrite + Ni	Total Kjelda	Total Nitrog	Total Phosp	Total Organ	Total Carbo	Total Inorganic Carbon		
KFA1	0.331	0.05	440	440	593	0.31	10.9	10.6		
KFA2	0.553	0.4	270	270	434	0.16	10.5	10.3		
KFA3	0.45	0.4	150	150	415	0.18	10	9.82		
KFA4	0.309	0.9	380	380	634	0.25	10.9	10.6		
KFA5	0.288	0.1	320	320	617	0.21	10.6	10.4		
KFA6	0.292	0.6	430	430	699	0.25	10.6	10.4		
KFA7	0.563	0.4	220	220	445	0.15	10.4	10.2		
KFA8	0.398	0.9	300	300	523	0.22	10.9	10.7		
KFA9	0.369	0.2	180	180	612	0.17	10.1	9.93		
KFA10	0.288	0.2	350	350	460	0.19	9.88	9.69		
KFA11	0.296	0.2	400	400	688	0.23	10.6	10.4		
KFA12	0.339	0.3	220	220	468	0.16	10	9.84		
KFA13	0.845	0.2	230	230	479	0.12	10.4	10.3		
KFA14	0.318	1.3	310	310	562	0.24	10.7	10.5		
KFA15	0.285	0.2	260	260	498	0.21	10.5	10.3		
KFA16	0.363	1	320	320	548	0.22	10.6	10.4		
KFA17	0.803	0.1	230	230	621	0.16	10.3	10.1		
KFA18	0.342	0.2	270	270	331	0.2	10.2	10		
KFA19	0.367	0.1	360	360	524	0.25	10.6	10.4		
KFA20	0.273	0.3	360	360	475	0.36	10.3	9.94		
KFA21	0.355	0.05	190	190	335	0.18	10	9.82		
KFA22	0.367	0.9	310	310	546	0.22	11	10.8		
KFA23	0.483	0.1	120	120	522	0.17	9.88	9.71		
KFA24	0.402	0.2	220	220	412	0.16	10.4	10.2		
KFA37	0.284	1.6	300	300	544	0.23	10.6	10.4		
KFA38	0.31	1	330	330	582	0.23	10.6	10.4		
KFA39	0.31	0.6	350	350	562	0.22	10.6	10.4		
KFA40	0.318	0.6	350	350	592	0.24	10.5	10.3		

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluc	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum
BMB1	0.46	166	164	2	2	2	16	5	2	5	BMB1	0.46	2	6	2	2	2	2	2	BMB1	0.46	2	2	2	2.5	362
BMB2	0.33	2.5	2.5	2	2	2	2	2	2	2	BMB2	0.33	2	2	2	2	2	2	2	BMB2	0.33	2	2	2	2.5	2
BMB3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BMB3	NA	NA	NA	NA	NA	NA	NA	NA	BMB3	NA	NA	NA	NA	NA	NA
BMB4	0.33	2.5	2.5	2	2	2	2	2	2	2	BMB4	0.33	2	2	2	2	2	2	2	BMB4	0.33	2	2	2	2.5	2
BMB5	0.21	27	16	2	21	21	158	29	122	104	BMB5	0.21	63	56	57	26	30	50	14	BMB5	0.21	28	7	25	2.5	854
BMB6	0.28	2.5	2.5	2	2	2	2	2	2	2	BMB6	0.28	2	2	2	2	2	2	2	BMB6	0.28	2	2	2	2.5	2
BMB7	NA	2.5	2.5	2	2	2	2	2	2	2	BMB7	NA	2	2	2	2	2	2	2	BMB7	NA	2	2	2	2.5	2
BMB8	0.26	2.5	2.5	2	2	2	2	2	2	2	BMB8	0.26	2	2	2	2	2	2	2	BMB8	0.26	2	2	2	2.5	2
BMB10	0.43	2.5	2.5	2	2	2	2	2	2	2	BMB10	0.43	2	2	2	2	2	2	2	BMB10	0.43	2	2	2	2.5	2
BMB11	0.43	2.5	2.5	2	2	2	2	2	2	2	BMB11	0.43	2	2	2	2	2	2	2	BMB11	0.43	2	2	2	2.5	2
BMB13	0.28	2.5	2.5	2	2	2	2	2	2	2	BMB13	0.28	2	2	2	2	2	2	2	BMB13	0.28	2	2	2	2.5	2
BMB14	0.27	2.5	2.5	2	2	2	2	2	2	2	BMB14	0.27	2	2	2	2	2	2	2	BMB14	0.27	2	2	2	2.5	2
BMB15	0.32	2.5	2.5	2	2	2	2	2	2	2	BMB15	0.32	2	2	2	2	2	2	2	BMB15	0.32	2	2	2	2.5	2
BMB16	0.24	2.5	2.5	2	2	2	2	2	2	2	BMB16	0.24	2	2	2	2	2	2	2	BMB16	0.24	2	2	2	2.5	2
BMB17	0.45	2.5	2.5	2	2	2	2	2	2	2	BMB17	0.45	2	2	2	2	2	2	2	BMB17	0.45	2	2	2	2.5	2
BMB18	0.19	11	8	2	2	2	2	2	2	2	BMB18	0.19	2	2	2	2	2	2	2	BMB18	0.19	2	2	2	2.5	19
BMB19	0.22	6	2.5	2	2	2	2	2	2	2	BMB19	0.22	2	2	2	2	2	2	2	BMB19	0.22	2	2	2	2.5	6
BMB20	0.32	5	2.5	2	2	2	6	2	9	6	BMB20	0.32	6	4	2	2	2	2	2	BMB20	0.32	2	2	2	2.5	36
BMB21	0.24	2.5	2.5	2	2	2	2	2	2	2	BMB21	0.24	2	2	2	2	2	2	2	BMB21	0.24	2	2	2	2.5	2
BMB22	0.24	2.5	2.5	2	2	2	9	2	11	10	BMB22	0.24	7	7	5	2	2	5	2	BMB22	0.24	4	2	2	2.5	58
BMB23	0.4	19	24	2	2	2	8	2	2	2	BMB23	0.4	2	2	2	2	2	2	2	BMB23	0.4	2	2	2	2.5	51
BMB24	0.34	2.5	2.5	2	2	2	2	2	2	2	BMB24	0.34	2	2	2	2	2	2	2	BMB24	0.34	2	2	2	2.5	2
BMB25	0.27	16	12	2	2	2	4	2	2	2	BMB25	0.27	2	2	2	2	2	2	2	BMB25	0.27	2	2	2	2.5	32
BMB31B	0.26	12	16	2	2	2	7	2	2	2	BMB31B	0.26	2	2	2	2	2	2	2	BMB31B	0.26	2	2	2	2.5	35
BMB33	0.33	42	50	2	2	2	15	7	2	4	BMB33	0.33	2	2	2	2	2	2	2	BMB33	0.33	2	2	2	2.5	118
BMB37	0.33	2.5	2.5	2	2	2	2	2	2	2	BMB37	0.33	2	2	2	2	2	2	2	BMB37	0.33	2	2	2	2.5	2
BMB38	0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	BMB38	0.42	NA	NA	NA	NA	NA	NA	NA	BMB38	0.42	NA	NA	NA	NA	NA
BMB39	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	BMB39	0.25	NA	NA	NA	NA	NA	NA	NA	BMB39	0.25	NA	NA	NA	NA	NA
BMB40	0.26	NA	NA	NA	NA	NA	NA	NA	NA	NA	BMB40	0.26	NA	NA	NA	NA	NA	NA	NA	BMB40	0.26	NA	NA	NA	NA	NA
BMB41	0.32	2.5	2.5	2	2	2	5	2	4	2	BMB41	0.32	2	2	2	2	2	2	2	BMB41	0.32	2	2	2	2.5	9
BMB42	0.34	2.5	2.5	2	2	2	2	2	2	2	BMB42	0.34	2	2	2	2	2	2	2	BMB42	0.34	2	2	2	2.5	2

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphtl	Acenaphtl	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokflu	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2	Coronene	PAHsum
BMB1	0.46	360.87	356.52	4.35	4.35	4.35	34.78	10.87	4.35	10.87	BMB1	0.46	4.35	13.04	4.35	4.35	4.35	4.35	4.35	BMB1	0.46	4.35	4.35	4.35	5.43	786.96
BMB2	0.33	7.58	7.58	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BMB2	0.33	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BMB2	0.33	6.06	6.06	6.06	7.58	6.06
BMB3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BMB3	NA	NA	NA	NA	NA	NA	NA	NA	BMB3	NA	NA	NA	NA	NA	NA
BMB4	0.33	7.58	7.58	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BMB4	0.33	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BMB4	0.33	6.06	6.06	6.06	7.58	6.06
BMB5	0.21	128.57	76.19	9.52	100.00	100.00	752.38	138.10	580.95	495.24	BMB5	0.21	300.00	266.67	271.43	123.81	142.86	238.10	66.67	BMB5	0.21	133.33	33.33	119.05	11.90	4066.67
BMB6	0.28	8.93	8.93	7.14	7.14	7.14	7.14	7.14	7.14	7.14	BMB6	0.28	7.14	7.14	7.14	7.14	7.14	7.14	7.14	BMB6	0.28	7.14	7.14	7.14	8.93	7.14
BMB7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BMB7	NA	NA	NA	NA	NA	NA	NA	NA	BMB7	NA	NA	NA	NA	NA	NA
BMB8	0.26	9.62	9.62	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BMB8	0.26	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BMB8	0.26	7.69	7.69	7.69	9.62	7.69
BMB10	0.43	5.81	5.81	4.65	4.65	4.65	4.65	4.65	4.65	4.65	BMB10	0.43	4.65	4.65	4.65	4.65	4.65	4.65	4.65	BMB10	0.43	4.65	4.65	4.65	5.81	4.65
BMB11	0.43	5.81	5.81	4.65	4.65	4.65	4.65	4.65	4.65	4.65	BMB11	0.43	4.65	4.65	4.65	4.65	4.65	4.65	4.65	BMB11	0.43	4.65	4.65	4.65	5.81	4.65
BMB13	0.28	8.93	8.93	7.14	7.14	7.14	7.14	7.14	7.14	7.14	BMB13	0.28	7.14	7.14	7.14	7.14	7.14	7.14	7.14	BMB13	0.28	7.14	7.14	7.14	8.93	7.14
BMB14	0.27	9.26	9.26	7.41	7.41	7.41	7.41	7.41	7.41	7.41	BMB14	0.27	7.41	7.41	7.41	7.41	7.41	7.41	7.41	BMB14	0.27	7.41	7.41	7.41	9.26	7.41
BMB15	0.32	7.81	7.81	6.25	6.25	6.25	6.25	6.25	6.25	6.25	BMB15	0.32	6.25	6.25	6.25	6.25	6.25	6.25	6.25	BMB15	0.32	6.25	6.25	6.25	7.81	6.25
BMB16	0.24	10.42	10.42	8.33	8.33	8.33	8.33	8.33	8.33	8.33	BMB16	0.24	8.33	8.33	8.33	8.33	8.33	8.33	8.33	BMB16	0.24	8.33	8.33	8.33	10.42	8.33
BMB17	0.45	5.56	5.56	4.44	4.44	4.44	4.44	4.44	4.44	4.44	BMB17	0.45	4.44	4.44	4.44	4.44	4.44	4.44	4.44	BMB17	0.45	4.44	4.44	4.44	5.56	4.44
BMB18	0.19	57.89	42.11	10.53	10.53	10.53	10.53	10.53	10.53	10.53	BMB18	0.19	10.53	10.53	10.53	10.53	10.53	10.53	10.53	BMB18	0.19	10.53	10.53	10.53	13.16	100.00
BMB19	0.22	27.27	11.36	9.09	9.09	9.09	9.09	9.09	9.09	9.09	BMB19	0.22	9.09	9.09	9.09	9.09	9.09	9.09	9.09	BMB19	0.22	9.09	9.09	9.09	11.36	27.27
BMB20	0.32	15.63	7.81	6.25	6.25	6.25	18.75	6.25	28.13	18.75	BMB20	0.32	18.75	12.50	6.25	6.25	6.25	6.25	6.25	BMB20	0.32	6.25	6.25	6.25	7.81	112.50
BMB21	0.24	10.42	10.42	8.33	8.33	8.33	8.33	8.33	8.33	8.33	BMB21	0.24	8.33	8.33	8.33	8.33	8.33	8.33	8.33	BMB21	0.24	8.33	8.33	8.33	10.42	8.33
BMB22	0.24	10.42	10.42	8.33	8.33	8.33	37.50	8.33	45.83	41.67	BMB22	0.24	29.17	29.17	20.83	8.33	8.33	20.83	8.33	BMB22	0.24	16.67	8.33	8.33	10.42	241.67
BMB23	0.40	47.50	60.00	5.00	5.00	5.00	20.00	5.00	5.00	5.00	BMB23	0.40	5.00	5.00	5.00	5.00	5.00	5.00	5.00	BMB23	0.40	5.00	5.00	5.00	6.25	127.50
BMB24	0.34	7.35	7.35	5.88	5.88	5.88	5.88	5.88	5.88	5.88	BMB24	0.34	5.88	5.88	5.88	5.88	5.88	5.88	5.88	BMB24	0.34	5.88	5.88	5.88	7.35	5.88
BMB25	0.27	59.26	44.44	7.41	7.41	7.41	14.81	7.41	7.41	7.41	BMB25	0.27	7.41	7.41	7.41	7.41	7.41	7.41	7.41	BMB25	0.27	7.41	7.41	7.41	9.26	118.52
BMB31B	0.26	46.15	61.54	7.69	7.69	7.69	26.92	7.69	7.69	7.69	BMB31B	0.26	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BMB31B	0.26	7.69	7.69	7.69	9.62	134.62
BMB33	0.33	127.27	151.52	6.06	6.06	6.06	45.45	21.21	6.06	12.12	BMB33	0.33	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BMB33	0.33	6.06	6.06	6.06	7.58	357.58
BMB37	0.33	7.58	7.58	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BMB37	0.33	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BMB37	0.33	6.06	6.06	6.06	7.58	6.06
BMB38	0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	BMB38	0.42	NA	NA	NA	NA	NA	NA	NA	BMB38	0.42	NA	NA	NA	NA	NA
BMB39	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	BMB39	0.25	NA	NA	NA	NA	NA	NA	NA	BMB39	0.25	NA	NA	NA	NA	NA
BMB40	0.26	NA	NA	NA	NA	NA	NA	NA	NA	NA	BMB40	0.26	NA	NA	NA	NA	NA	NA	NA	BMB40	0.26	NA	NA	NA	NA	NA
BMB41	0.32	7.81	7.81	6.25	6.25	6.25	15.63	6.25	12.50	6.25	BMB41	0.32	6.25	6.25	6.25	6.25	6.25	6.25	6.25	BMB41	0.32	6.25	6.25	6.25	7.81	28.13
BMB42	0.34	7.35	7.35	5.88	5.88	5.88	5.88	5.88	5.88	5.88	BMB42	0.34	5.88	5.88	5.88	5.88	5.88	5.88	5.88	BMB42	0.34	5.88	5.88	5.88	7.35	5.88

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	SampleID_	Lead	Manganes	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	Methyl me	GrossAlpha	GrossBeta
BMB1	880	2230	30	0.25	4.1	0.1	5	9.5	0.25	BMB1	6	20	2	0.3	0.05	7.3	31.7	0.005	NA	250	250
BMB2	980	1520	20	0.25	3.12	0.05	4.9	0.5	0.25	BMB2	1.2	16	2.1	0.2	0.2	5.6	2.1	0.005	NA	NA	NA
BMB3	790	2650	10	0.25	6.46	0.05	5.8	0.5	0.25	BMB3	1.3	34	1.4	0.2	0.05	9.7	2.2	0.005	NA	NA	NA
BMB4	1370	1930	20	0.25	3.88	0.05	5.2	0.5	0.25	BMB4	1.4	23	2.1	0.3	0.05	7.4	2.4	0.005	NA	NA	NA
BMB5	620	2140	20	0.25	4.81	0.05	4.6	1.2	0.6	BMB5	3	26	1.3	0.1	0.05	8.4	48	0.005	NA	250	250
BMB6	840	1870	10	0.25	4.28	0.05	4.9	0.5	0.25	BMB6	1.4	26	1.8	0.2	0.05	8.4	2.2	0.005	NA	NA	NA
BMB7	590	1250	20	0.25	3.56	0.1	4.1	0.5	0.25	BMB7	1.1	17	1.5	0.2	0.05	6	2	0.005	NA	NA	NA
BMB8	1170	1960	10	0.25	3.98	0.05	6.3	1	0.25	BMB8	1.4	20	2.3	0.2	0.05	8.6	3.1	0.005	NA	NA	NA
BMB10	1180	1810	20	0.25	4.01	0.1	5.4	1	0.25	BMB10	1.6	25	2.8	0.3	0.05	8.3	3.6	0.005	NA	NA	NA
BMB11	1820	2370	30	0.25	3.59	0.05	6.4	1.2	0.25	BMB11	1.5	22	2.6	0.3	0.05	8.2	4.8	0.01	0.05	NA	NA
BMB13	840	1880	20	0.25	4.25	0.05	5.1	0.5	0.25	BMB13	1.1	27	2	0.2	0.3	7.3	2.3	0.005	NA	NA	NA
BMB14	910	1760	10	0.25	4.24	0.1	5.1	0.5	0.25	BMB14	1.3	21	1.8	0.2	0.05	7.5	1.9	0.005	NA	NA	NA
BMB15	1170	1350	20	0.25	2.77	0.05	4.4	0.5	0.25	BMB15	1.1	17	2	0.3	0.05	6.2	2.1	0.005	NA	NA	NA
BMB16	1010	2810	20	0.25	6.13	0.05	6.5	3.4	0.25	BMB16	2.9	22	1.6	0.3	0.05	10.9	13.4	0.005	NA	250	250
BMB17	1040	1300	10	0.25	3.28	0.1	4.2	0.5	0.25	BMB17	1.5	50	2.1	0.3	0.05	6.3	2.9	0.005	NA	NA	NA
BMB18	1320	7180	50	1.39	20.2	0.1	10.5	56.7	1.9	BMB18	44.3	69	2.4	0.2	0.05	16	471	0.005	NA	250	250
BMB19	750	1480	5	0.25	3.79	0.05	4.3	0.5	0.25	BMB19	0.5	26	1.5	0.2	0.05	6.9	2	0.005	NA	NA	NA
BMB20	1120	1840	20	0.25	3.14	0.05	5.3	0.5	0.25	BMB20	1.2	18	2.2	0.2	0.05	7.2	3.3	0.005	NA	NA	NA
BMB21	1290	1470	20	0.25	2.58	0.05	5	0.5	0.25	BMB21	1.2	19	2.2	0.3	0.05	6.8	2.5	0.005	NA	NA	NA
BMB22	790	1140	5	0.25	2.39	0.05	4.2	0.5	0.25	BMB22	1	16	2	0.2	0.1	5.3	2.3	0.005	NA	NA	NA
BMB23	820	2580	20	0.25	4.27	0.1	5	2	0.25	BMB23	2.4	21	1.6	0.3	0.05	9.1	15.5	0.005	NA	250	250
BMB24	1660	1950	20	0.25	2.78	0.1	6.6	1.4	0.25	BMB24	1.8	22	3.2	0.3	0.05	8.2	4	0.005	NA	NA	NA
BMB25	1050	1950	20	0.25	4.16	0.05	5.9	1.7	0.25	BMB25	2.4	19	1.8	0.2	0.05	8.3	10.1	0.005	NA	250	250
BMB31B	1200	6830	170	0.91	13.9	0.05	9.2	58.6	1.9	BMB31B	46.8	60	2.7	0.2	0.05	12.2	343	0.005	NA	250	250
BMB33	810	7990	30	0.25	4.34	0.05	6.2	1.7	0.25	BMB33	1.6	60	2.8	0.2	0.05	9.3	19	0.005	NA	NA	NA
BMB37	1230	2130	20	0.25	3.97	0.05	6	1	0.25	BMB37	1.6	26	2.3	0.3	0.05	7.8	2.6	0.005	NA	NA	NA
BMB38	1430	2000	20	0.25	3.35	0.05	5.8	1	0.25	BMB38	1.5	22	2.6	0.3	0.1	7.8	3.4	0.005	NA	NA	NA
BMB39	970	2180	10	0.25	5.01	0.05	6.4	0.5	0.25	BMB39	1.4	22	1.7	0.2	0.05	9.6	2.2	0.005	NA	NA	NA
BMB40	1020	1840	10	0.25	4.02	0.05	5.9	0.5	0.25	BMB40	1.3	19	2.1	0.2	0.1	8.6	2.4	0.005	NA	NA	NA
BMB41	1060	1520	20	0.25	2.84	0.05	4.6	0.5	0.25	BMB41	1.3	19	1.6	0.2	0.1	6.3	2.5	0.005	NA	NA	NA
BMB42	1810	2480	30	0.25	3.8	0.1	7.8	1.4	0.25	BMB42	1.8	24	3.9	0.3	0.05	9.4	3.9	0.005	NA	NA	NA

SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plu	PS2360plu	PS4750plu	PS9500plu	PS19000pl	PS37500pl	PS75000pl	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
BMB1	-60.00	180.00	141.42	33.60	81.00	76.00	68.00	65.00	63.00	BMB1	56.00	41.00	28.00	13.00	0.50	0.50	0.50	1.65	BMB1	12.00	4.00	38.00	46.00	0.50	2.36
BMB2	-60.00	1886.36	1879.49	40.40	91.00	83.00	68.00	60.00	52.00	BMB2	37.00	20.00	11.00	4.00	0.50	0.50	0.50	0.71	BMB2	8.00	0.50	67.00	25.00	0.50	2.38
BMB3	-59.00	595.63	1978.00	40.20	97.00	93.00	78.00	66.00	55.00	BMB3	30.00	9.00	3.00	1.00	0.50	0.50	0.50	0.72	BMB3	3.00	0.50	82.00	15.00	0.50	2.40
BMB4	-61.00	1336.07	1390.14	45.20	80.00	70.00	57.00	52.00	47.00	BMB4	34.00	15.00	8.00	3.00	0.50	0.50	0.50	0.50	BMB4	14.00	3.00	62.00	21.00	0.50	2.36
BMB5	-60.00	79.71	70.71	37.30	98.00	97.00	91.00	86.00	78.00	BMB5	51.00	14.00	1.00	0.50	0.50	0.50	0.50	1.21	BMB5	2.00	0.50	73.00	25.00	0.50	2.43
BMB6	-60.00	374.47	353.55	38.20	86.00	80.00	67.00	59.00	50.00	BMB6	29.00	7.00	2.00	0.50	0.50	0.50	0.50	0.63	BMB6	9.00	4.00	73.00	14.00	0.50	2.33
BMB7	-59.25	1261.41	1264.91	29.70	96.00	91.00	85.00	82.00	78.00	BMB7	69.00	46.00	27.00	8.00	0.50	0.50	0.50	2.16	BMB7	4.00	0.50	43.00	53.00	0.50	2.42
BMB8	-60.00	455.56	412.31	37.50	87.00	81.00	67.00	59.00	51.00	BMB8	32.00	12.00	4.00	2.00	0.50	0.50	0.50	0.63	BMB8	10.00	3.00	69.00	18.00	0.50	2.39
BMB10	-60.00	362.52	364.01	33.60	80.00	73.00	63.00	57.00	52.00	BMB10	40.00	23.00	14.00	6.00	0.50	0.50	0.50	0.70	BMB10	11.00	9.00	52.00	28.00	0.50	2.28
BMB11	-60.00	391.69	380.79	41.40	80.00	67.00	50.00	43.00	36.00	BMB11	22.00	6.00	2.00	0.50	0.50	0.50	0.50	0.32	BMB11	10.00	10.00	69.00	11.00	0.50	2.39
BMB13	-59.25	458.97	460.98	43.30	93.00	88.00	73.00	63.00	53.00	BMB13	34.00	15.00	5.00	2.00	0.50	0.50	0.50	0.70	BMB13	6.00	1.00	72.00	21.00	0.50	2.34
BMB14	-60.50	1240.43	1735.66	45.30	93.00	86.00	70.00	63.00	54.00	BMB14	37.00	17.00	12.00	8.00	0.50	0.50	0.50	0.74	BMB14	7.00	0.50	70.00	23.00	0.50	2.34
BMB15	-60.00	1989.57	1978.00	34.20	82.00	75.00	64.00	57.00	50.00	BMB15	36.00	19.00	9.00	4.00	0.50	0.50	0.50	0.60	BMB15	13.00	3.00	60.00	24.00	0.50	2.36
BMB16	-60.00	141.91	100.00	37.20	88.00	80.00	64.00	55.00	45.00	BMB16	27.00	9.00	5.00	4.00	0.50	0.50	0.50	0.51	BMB16	7.00	5.00	73.00	15.00	0.50	2.36
BMB17	-60.00	789.65	790.57	34.10	92.00	86.00	80.00	78.00	76.00	BMB17	69.00	46.00	30.00	18.00	0.50	0.50	0.50	2.16	BMB17	6.00	3.00	38.00	53.00	0.50	2.25
BMB18	-60.00	131.61	141.42	27.40	97.00	96.00	87.00	76.00	62.00	BMB18	37.00	15.00	7.00	2.00	0.50	0.50	0.50	0.89	BMB18	3.00	0.50	75.00	22.00	0.50	2.52
BMB19	-60.00	442.94	403.11	28.50	90.00	86.00	78.00	72.00	66.00	BMB19	51.00	28.00	18.00	8.00	0.50	0.50	0.50	1.23	BMB19	9.00	1.00	55.00	35.00	0.50	2.36
BMB20	-60.00	436.29	452.77	41.50	93.00	86.00	70.00	62.00	53.00	BMB20	37.00	19.00	14.00	10.00	0.50	0.50	0.50	0.71	BMB20	4.00	3.00	69.00	24.00	0.50	2.37
BMB21	-60.00	1564.10	1552.42	35.10	87.00	80.00	66.00	59.00	50.00	BMB21	30.00	9.00	2.00	0.50	0.50	0.50	0.50	0.60	BMB21	10.00	0.50	75.00	15.00	0.50	2.39
BMB22	-61.00	709.87	950.00	30.60	90.00	86.00	80.00	76.00	71.00	BMB22	58.00	32.00	15.00	2.00	0.50	0.50	0.50	1.56	BMB22	10.00	0.50	50.00	40.00	0.50	2.33
BMB23	-60.00	73.83	50.00	25.70	96.00	94.00	90.00	86.00	81.00	BMB23	60.00	25.00	6.00	0.50	0.50	0.50	0.50	1.52	BMB23	4.00	0.50	60.00	36.00	0.50	2.28
BMB24	-59.25	1452.69	1450.86	38.00	84.00	72.00	54.00	47.00	40.00	BMB24	27.00	10.00	3.00	0.50	0.50	0.50	0.50	0.37	BMB24	8.00	8.00	68.00	16.00	0.50	2.31
BMB25	-60.00	124.68	111.80	36.50	86.00	80.00	70.00	65.00	58.00	BMB25	41.00	19.00	10.00	3.00	0.50	0.50	0.50	0.87	BMB25	10.00	3.00	61.00	26.00	0.50	2.33
BMB31B	-60.00	98.48	111.80	35.60	94.00	91.00	79.00	67.00	52.00	BMB31B	31.00	15.00	8.00	1.00	0.50	0.50	0.50	0.66	BMB31B	5.00	0.50	75.00	20.00	0.50	2.48
BMB33	-60.00	118.52	100.00	41.50	94.00	87.00	69.00	59.00	50.00	BMB33	31.00	13.00	5.00	2.00	0.50	0.50	0.50	0.60	BMB33	3.00	3.00	76.00	18.00	0.50	2.35
BMB37	-61.00	1336.07	1390.14	37.40	86.00	80.00	67.00	60.00	52.00	BMB37	35.00	12.00	2.00	0.50	0.50	0.50	0.50	0.67	BMB37	9.00	2.00	70.00	19.00	0.50	2.37
BMB38	-61.00	1336.07	1390.14	40.30	78.00	69.00	56.00	51.00	46.00	BMB38	33.00	15.00	7.00	3.00	0.50	0.50	0.50	0.46	BMB38	12.00	7.00	60.00	21.00	0.50	2.37
BMB39	-60.50	1240.43	1735.66	36.50	93.00	87.00	69.00	57.00	45.00	BMB39	25.00	8.00	2.00	0.50	0.50	0.50	0.50	0.53	BMB39	3.00	4.00	80.00	13.00	0.50	2.38
BMB40	-60.50	1240.43	1735.66	41.00	92.00	87.00	74.00	66.00	58.00	BMB40	42.00	21.00	18.00	17.00	0.50	0.50	0.50	0.89	BMB40	6.00	0.50	67.00	27.00	0.50	2.37
BMB41	-59.25	1452.69	1450.86	40.90	87.00	77.00	61.00	55.00	50.00	BMB41	40.00	24.00	17.00	10.00	0.50	0.50	0.50	0.60	BMB41	6.00	4.00	61.00	29.00	0.50	2.39
BMB42	-59.25	1452.69	1450.86	43.40	87.00	74.00	53.00	45.00	39.00	BMB42	27.00	12.00	6.00	3.00	0.50	0.50	0.50	0.35	BMB42	8.00	4.00	72.00	16.00	0.50	2.36

SampleID_	MedianPS	Nitrite + Ni	Total Kjelda	Total Nitro	Total Phos	Total Orgar	Total Carbo	Total Inorganic Carbon		
BMB1	1.652	0.2	1510	1510	579	0.46	11.3	10.8		
BMB2	0.709	0.1	480	480	336	0.33	11.4	11.1		
BMB3	0.716	0.1	340	340	396	NA	NA	10.5		
BMB4	0.495	0.2	570	570	397	0.33	11.1	10.8		
BMB5	1.212	0.7	340	340	415	0.21	11.1	10.9		
BMB6	0.626	0.4	500	500	500	0.28	11.2	10.9		
BMB7	2.155	0.5	390	390	330	NA	NA	10.5		
BMB8	0.631	0.2	570	570	471	0.26	11.2	10.9		
BMB10	0.697	2.8	650	650	512	0.43	11.3	10.9		
BMB11	0.316	0.1	530	530	404	0.43	11.1	10.7		
BMB13	0.697	0.2	410	410	406	0.28	11.4	11.1		
BMB14	0.736	0.05	540	540	384	0.27	11.3	11		
BMB15	0.6	0.7	430	430	326	0.32	11.2	10.9		
BMB16	0.513	0.7	520	520	505	0.24	11.3	11.1		
BMB17	2.155	0.8	880	880	434	0.45	11.3	10.8		
BMB18	0.89	0.5	180	180	376	0.19	10.4	10.2		
BMB19	1.231	0.8	560	560	355	0.22	11.5	11.3		
BMB20	0.709	0.05	560	560	451	0.32	11.1	10.8		
BMB21	0.6	0.4	400	400	401	0.24	11.2	11		
BMB22	1.558	2.2	510	510	408	0.24	11.5	11.3		
BMB23	1.517	2.4	540	540	577	0.4	11.2	10.8		
BMB24	0.371	0.05	500	500	345	0.34	11.2	10.9		
BMB25	0.873	1.4	560	560	468	0.27	11.2	10.9		
BMB31B	0.655	0.2	620	620	563	0.26	10.1	9.84		
BMB33	0.6	0.2	350	350	444	0.33	10.9	10.6		
BMB37	0.668	0.4	640	640	437	0.33	11.2	10.9		
BMB38	0.46	0.2	820	820	483	0.42	11	10.6		
BMB39	0.527	0.3	680	680	364	0.25	11	10.8		
BMB40	0.89	0.1	660	660	356	0.26	11	10.7		
BMB41	0.6	0.05	470	470	369	0.32	11.4	11.1		
BMB42	0.347	0.2	470	470	368	0.34	11.3	11		

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum	FacDist
BTA1	0.53	104	171	2	9	16	69	37	17	19	BTA1	0.53	11	6	2	2	2	13	4	BTA1	0.53	2	2	2	2.5	476	50.00
BTA2	0.25	2.5	2.5	2	2	2	2	2	2	2	BTA2	0.25	2	2	2	2	2	2	2	BTA2	0.25	2	2	2	2.5	2	1852.70
BTA3	0.36	42	67	2	2	6	29	14	7	8	BTA3	0.36	5	2	2	2	2	5	2	BTA3	0.36	2	2	2	2.5	183	100.00
BTA4	0.19	2.5	2.5	2	2	2	2	2	2	2	BTA4	0.19	2	2	2	2	2	2	2	BTA4	0.19	2	2	2	2.5	2	1637.83
BTA5	0.26	9	10	2	2	2	5	2	2	2	BTA5	0.26	2	2	2	2	2	2	2	BTA5	0.26	2	2	2	2.5	24	111.80
BTA6	0.23	2.5	2.5	2	2	2	2	2	2	2	BTA6	0.23	2	2	2	2	2	2	2	BTA6	0.23	2	2	2	2.5	2	206.16
BTA7	0.26	2.5	2.5	2	2	2	2	2	2	2	BTA7	0.26	2	2	2	2	2	2	2	BTA7	0.26	2	2	2	2.5	2	1030.78
BTA8	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA8	0.25	NA	NA	NA	NA	NA	NA	NA	BTA8	0.25	NA	NA	NA	NA	NA	212.13
BTA9	0.1	2.5	2.5	2	2	2	2	2	2	2	BTA9	0.1	2	2	2	2	2	2	2	BTA9	0.1	2	2	2	2.5	2	1756.42
BTA10	0.26	2.5	2.5	2	2	2	2	2	2	2	BTA10	0.26	2	2	2	2	2	2	2	BTA10	0.26	2	2	2	2.5	2	1665.08
BTA12	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA12	0.23	NA	NA	NA	NA	NA	NA	NA	BTA12	0.23	NA	NA	NA	NA	NA	934.08
BTA13	0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA13	0.19	NA	NA	NA	NA	NA	NA	NA	BTA13	0.19	NA	NA	NA	NA	NA	70.71
BTA14	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA14	0.25	NA	NA	NA	NA	NA	NA	NA	BTA14	0.25	NA	NA	NA	NA	NA	860.23
BTA15	0.31	91	115	2	7	13	50	26	18	18	BTA15	0.31	10	6	2	2	2	10	5	BTA15	0.31	2	2	2	2.5	369	250.00
BTA16	0.34	13	24	2	17	13	27	7	29	28	BTA16	0.34	10	8	8	2	2	8	5	BTA16	0.34	2	2	2	2.5	197	50.00
BTA17	0.24	2.5	2.5	2	2	2	2	2	2	2	BTA17	0.24	2	2	2	2	2	2	2	BTA17	0.24	2	2	2	2.5	2	141.42
BTA18	0.32	2.5	2.5	2	2	2	2	2	2	2	BTA18	0.32	2	2	2	2	2	2	2	BTA18	0.32	2	2	2	2.5	2	1166.19
BTA20	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA20	0.25	NA	NA	NA	NA	NA	NA	NA	BTA20	0.25	NA	NA	NA	NA	NA	1073.55
BTA21	0.3	36	42	2	2	2	20	11	4	5	BTA21	0.3	2	2	2	2	2	2	2	BTA21	0.3	2	2	2	2.5	118	100.00
BTA22	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA22	0.32	NA	NA	NA	NA	NA	NA	NA	BTA22	0.32	NA	NA	NA	NA	NA	316.23
BTA23	0.46	93	148	2	10	21	53	23	16	21	BTA23	0.46	8	6	6	4	2	10	6	BTA23	0.46	2	2	2	2.5	425	70.71
BTA24	0.26	2.5	2.5	2	2	2	2	2	2	2	BTA24	0.26	2	2	2	2	2	2	2	BTA24	0.26	2	2	2	2.5	2	1323.82
BTA25	0.33	2.5	5	2	2	2	8	2	4	4	BTA25	0.33	2	2	2	2	2	2	2	BTA25	0.33	2	2	2	2.5	21	70.71
BTA26	0.22	6	2.5	2	2	2	2	2	2	2	BTA26	0.22	2	2	2	2	2	2	2	BTA26	0.22	2	2	2	2.5	6	715.89
BTA37	0.22	2.5	5	2	2	2	4	2	2	2	BTA37	0.22	2	2	2	2	2	2	2	BTA37	0.22	2	2	2	2.5	9	141.42
BTA38	0.29	2.5	2.5	2	2	2	2	2	2	2	BTA38	0.29	2	2	2	2	2	2	2	BTA38	0.29	2	2	2	2.5	2	141.42
BTA39	0.25	2.5	2.5	2	2	2	2	2	2	2	BTA39	0.25	2	2	2	2	2	2	2	BTA39	0.25	2	2	2	2.5	2	206.16
BTA40	0.33	2.5	2.5	2	2	2	2	2	2	2	BTA40	0.33	2	2	2	2	2	2	2	BTA40	0.33	2	2	2	2.5	2	206.16
BTA41	0.23	2.5	2.5	2	2	2	2	2	2	2	BTA41	0.23	2	2	2	2	2	2	2	BTA41	0.23	2	2	2	2.5	2	1637.83
BTA42	0.14	2.5	2.5	2	2	2	2	2	2	2	BTA42	0.14	2	2	2	2	2	2	2	BTA42	0.14	2	2	2	2.5	2	1637.83

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluc	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum	FacDist
BTA1	0.53	196.23	322.64	3.77	16.98	30.19	130.19	69.81	32.08	35.85	BTA1	0.53	20.75	11.32	3.77	3.77	3.77	24.53	7.55	BTA1	0.53	3.77	3.77	3.77	4.72	898.11	50.00
BTA2	0.25	10.00	10.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	BTA2	0.25	8.00	8.00	8.00	8.00	8.00	8.00	8.00	BTA2	0.25	8.00	8.00	8.00	10.00	8.00	1852.70
BTA3	0.36	116.67	186.11	5.56	5.56	16.67	80.56	38.89	19.44	22.22	BTA3	0.36	13.89	5.56	5.56	5.56	5.56	13.89	5.56	BTA3	0.36	5.56	5.56	5.56	6.94	508.33	100.00
BTA4	0.19	13.16	13.16	10.53	10.53	10.53	10.53	10.53	10.53	10.53	BTA4	0.19	10.53	10.53	10.53	10.53	10.53	10.53	10.53	BTA4	0.19	10.53	10.53	10.53	13.16	10.53	1637.83
BTA5	0.26	34.62	38.46	7.69	7.69	7.69	19.23	7.69	7.69	7.69	BTA5	0.26	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BTA5	0.26	7.69	7.69	7.69	9.62	92.31	111.80
BTA6	0.23	10.87	10.87	8.70	8.70	8.70	8.70	8.70	8.70	8.70	BTA6	0.23	8.70	8.70	8.70	8.70	8.70	8.70	8.70	BTA6	0.23	8.70	8.70	8.70	10.87	8.70	206.16
BTA7	0.26	9.62	9.62	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BTA7	0.26	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BTA7	0.26	7.69	7.69	7.69	9.62	7.69	1030.78
BTA8	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA8	0.25	NA	NA	NA	NA	NA	NA	NA	BTA8	0.25	NA	NA	NA	NA	NA	212.13
BTA9	0.10	25.00	25.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	BTA9	0.10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	BTA9	0.10	20.00	20.00	20.00	25.00	20.00	1756.42
BTA10	0.26	9.62	9.62	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BTA10	0.26	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BTA10	0.26	7.69	7.69	7.69	9.62	7.69	1665.08
BTA12	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA12	0.23	NA	NA	NA	NA	NA	NA	NA	BTA12	0.23	NA	NA	NA	NA	NA	934.08
BTA13	0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA13	0.19	NA	NA	NA	NA	NA	NA	NA	BTA13	0.19	NA	NA	NA	NA	NA	70.71
BTA14	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA14	0.25	NA	NA	NA	NA	NA	NA	NA	BTA14	0.25	NA	NA	NA	NA	NA	860.23
BTA15	0.31	293.55	370.97	6.45	22.58	41.94	161.29	83.87	58.06	58.06	BTA15	0.31	32.26	19.35	6.45	6.45	6.45	32.26	16.13	BTA15	0.31	6.45	6.45	6.45	8.06	1190.32	250.00
BTA16	0.34	38.24	70.59	5.88	50.00	38.24	79.41	20.59	85.29	82.35	BTA16	0.34	29.41	23.53	23.53	5.88	5.88	23.53	14.71	BTA16	0.34	5.88	5.88	5.88	7.35	579.41	50.00
BTA17	0.24	10.42	10.42	8.33	8.33	8.33	8.33	8.33	8.33	8.33	BTA17	0.24	8.33	8.33	8.33	8.33	8.33	8.33	8.33	BTA17	0.24	8.33	8.33	8.33	10.42	8.33	141.42
BTA18	0.32	7.81	7.81	6.25	6.25	6.25	6.25	6.25	6.25	6.25	BTA18	0.32	6.25	6.25	6.25	6.25	6.25	6.25	6.25	BTA18	0.32	6.25	6.25	6.25	7.81	6.25	1166.19
BTA20	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA20	0.25	NA	NA	NA	NA	NA	NA	NA	BTA20	0.25	NA	NA	NA	NA	NA	1073.55
BTA21	0.30	120.00	140.00	6.67	6.67	6.67	66.67	36.67	13.33	16.67	BTA21	0.30	6.67	6.67	6.67	6.67	6.67	6.67	6.67	BTA21	0.30	6.67	6.67	6.67	8.33	393.33	100.00
BTA22	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	BTA22	0.32	NA	NA	NA	NA	NA	NA	NA	BTA22	0.32	NA	NA	NA	NA	NA	316.23
BTA23	0.46	202.17	321.74	4.35	21.74	45.65	115.22	50.00	34.78	45.65	BTA23	0.46	17.39	13.04	13.04	8.70	4.35	21.74	13.04	BTA23	0.46	4.35	4.35	4.35	5.43	923.91	70.71
BTA24	0.26	9.62	9.62	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BTA24	0.26	7.69	7.69	7.69	7.69	7.69	7.69	7.69	BTA24	0.26	7.69	7.69	7.69	9.62	7.69	1323.82
BTA25	0.33	7.58	15.15	6.06	6.06	6.06	24.24	6.06	12.12	12.12	BTA25	0.33	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BTA25	0.33	6.06	6.06	6.06	7.58	63.64	70.71
BTA26	0.22	27.27	11.36	9.09	9.09	9.09	9.09	9.09	9.09	9.09	BTA26	0.22	9.09	9.09	9.09	9.09	9.09	9.09	9.09	BTA26	0.22	9.09	9.09	9.09	11.36	27.27	715.89
BTA37	0.22	11.36	22.73	9.09	9.09	9.09	18.18	9.09	9.09	9.09	BTA37	0.22	9.09	9.09	9.09	9.09	9.09	9.09	9.09	BTA37	0.22	9.09	9.09	9.09	11.36	40.91	141.42
BTA38	0.29	8.62	8.62	6.90	6.90	6.90	6.90	6.90	6.90	6.90	BTA38	0.29	6.90	6.90	6.90	6.90	6.90	6.90	6.90	BTA38	0.29	6.90	6.90	6.90	8.62	6.90	141.42
BTA39	0.25	10.00	10.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	BTA39	0.25	8.00	8.00	8.00	8.00	8.00	8.00	8.00	BTA39	0.25	8.00	8.00	8.00	10.00	8.00	206.16
BTA40	0.33	7.58	7.58	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BTA40	0.33	6.06	6.06	6.06	6.06	6.06	6.06	6.06	BTA40	0.33	6.06	6.06	6.06	7.58	6.06	206.16
BTA41	0.23	10.87	10.87	8.70	8.70	8.70	8.70	8.70	8.70	8.70	BTA41	0.23	8.70	8.70	8.70	8.70	8.70	8.70	8.70	BTA41	0.23	8.70	8.70	8.70	10.87	8.70	1637.83
BTA42	0.14	17.86	17.86	14.29	14.29	14.29	14.29	14.29	14.29	14.29	BTA42	0.14	14.29	14.29	14.29	14.29	14.29	14.29	14.29	BTA42	0.14	14.29	14.29	14.29	17.86	14.29	1637.83

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	SampleID_	Lead	Manganes	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	Methyl me	GrossAlph	GrossBeta	FacDist
BTA1	690	3140	20	0.25	5.95	0.05	6.1	1.8	0.25	BTA1	1.8	18	1.3	0.2	0.05	11.7	8.1	0.005	NA	NA	NA	50.00
BTA2	1420	5100	10	0.25	12.9	0.05	10.9	0.5	0.25	BTA2	1.6	26	1.6	0.2	0.05	20.6	2.5	0.005	NA	NA	NA	1852.70
BTA3	1100	4060	30	0.25	7.21	0.05	7.7	1.1	0.25	BTA3	3.1	22	1.2	0.2	0.05	13.9	16.7	0.01	NA	250	250	100.00
BTA4	930	4080	10	0.25	9.36	0.05	7.9	0.5	0.25	BTA4	3	28	1.4	0.2	0.6	16.5	3.5	0.005	NA	NA	NA	1637.83
BTA5	1000	3150	20	0.25	6.66	0.05	6.8	0.5	0.25	BTA5	1.3	17	1.4	0.2	0.05	12.6	4.4	0.005	NA	NA	NA	111.80
BTA6	1220	3850	10	0.25	8.14	0.05	8.4	0.5	0.25	BTA6	1.5	26	1.6	0.2	0.05	14.7	3.9	0.005	NA	NA	NA	206.16
BTA7	1740	4660	10	0.25	10.5	0.05	10.8	0.5	0.25	BTA7	1.8	28	2.3	0.3	0.05	19.4	3.7	0.005	NA	NA	NA	1030.78
BTA8	1340	3890	20	0.25	7.99	0.05	8.2	0.5	0.25	BTA8	1.4	23	1.5	0.2	0.05	14.5	3.6	0.005	NA	250	250	212.13
BTA9	1350	4130	10	0.25	9.59	0.05	9.2	0.5	0.25	BTA9	1.6	29	1.6	0.2	0.05	16.9	3.1	0.005	NA	NA	NA	1756.42
BTA10	1060	3550	20	0.25	8.96	0.05	7.1	0.5	0.25	BTA10	1.4	27	1.4	0.2	0.05	13.5	2.6	0.005	NA	NA	NA	1665.08
BTA12	1280	4210	10	0.25	8.95	0.05	8.2	0.5	0.25	BTA12	1.4	24	1.8	0.2	0.05	14.5	3.2	0.005	NA	NA	NA	934.08
BTA13	860	4440	20	0.25	7.83	0.05	8.4	1.1	0.25	BTA13	2.3	22	1.1	0.2	0.05	14.5	20.1	0.01	NA	250	250	70.71
BTA14	1080	2580	5	0.25	8.27	0.05	7.1	0.5	0.25	BTA14	1.4	26	1.9	0.2	0.05	13.8	3.8	0.005	NA	NA	NA	860.23
BTA15	740	2910	10	0.25	6.05	0.05	6.7	0.5	0.25	BTA15	1.7	20	1.1	0.2	0.05	11.3	7.6	0.005	NA	NA	NA	250.00
BTA16	840	4250	20	0.25	7.83	5.4	8.5	1.4	0.25	BTA16	5.6	23	1.4	0.2	0.05	14.2	102	0.01	NA	250	250	50.00
BTA17	930	2960	10	0.25	6.46	0.05	7.6	0.5	0.25	BTA17	1.4	22	1.1	0.2	0.05	12.9	4	0.005	NA	250	250	141.42
BTA18	1380	3380	10	0.25	7.44	0.05	8.8	0.5	0.25	BTA18	1.5	25	1.8	0.2	0.05	13.9	3.6	0.005	NA	NA	NA	1166.19
BTA20	1220	4210	5	0.25	10	0.05	10	0.5	0.25	BTA20	1.6	26	1.6	0.2	0.05	18.5	3.5	0.005	NA	NA	NA	1073.55
BTA21	740	2840	10	0.25	6.84	0.05	7.1	0.5	0.25	BTA21	1.6	21	1.2	0.2	0.05	13	5.6	0.005	NA	250	250	100.00
BTA22	940	3490	10	0.25	8.14	0.05	7.3	0.5	0.25	BTA22	1.6	22	1.4	0.2	0.05	16.1	2.8	0.005	NA	NA	NA	316.23
BTA23	1060	3250	80	0.51	6.25	0.3	8.9	4.1	0.25	BTA23	10.5	26	3.3	0.2	0.05	11.4	128	0.04	NA	250	250	70.71
BTA24	1050	3600	5	0.25	8.97	0.05	9.8	0.5	0.25	BTA24	1.5	24	1.7	0.2	0.05	17.2	3.7	0.005	NA	NA	NA	1323.82
BTA25	740	3650	20	0.25	6.06	0.2	7.1	1.4	0.25	BTA25	15	21	1	0.2	0.2	13.9	58.5	0.02	NA	NA	NA	70.71
BTA26	1090	2780	20	0.25	6.82	0.05	7	0.5	0.25	BTA26	1.4	23	1.7	0.2	0.1	12.7	2.9	0.005	NA	NA	NA	715.89
BTA37	840	3230	10	0.25	7.4	0.05	7.6	0.5	0.25	BTA37	1.3	22	1.2	0.2	0.1	13.8	4.6	0.005	NA	250	250	141.42
BTA38	810	2490	10	0.25	5.51	0.05	5.5	0.5	0.25	BTA38	1.3	17	1.1	0.2	0.05	10.7	3.5	0.005	NA	250	250	141.42
BTA39	850	3420	10	0.25	3.52	0.05	3	0.5	0.25	BTA39	0.5	5	0.5	0.1	0.1	6.8	1.9	0.005	NA	NA	NA	206.16
BTA40	830	3570	5	0.25	7.14	0.05	6.8	0.5	0.25	BTA40	1.3	23	1.4	0.2	0.1	13.2	3.8	0.005	NA	NA	NA	206.16
BTA41	1520	4620	20	0.25	10.7	0.05	9.5	0.5	0.25	BTA41	2	31	2.2	0.3	0.05	21.2	3.6	0.005	NA	NA	NA	1637.83
BTA42	1180	3530	10	0.25	8.56	0.05	8.6	0.5	0.25	BTA42	1.3	29	1.5	0.1	0.05	16.2	3.3	0.005	NA	NA	NA	1637.83

SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plus	PS2360plus	PS4750plus	PS9500plus	PS19000pl	PS37500pl	PS75000pl	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
BTA1	-45.75	39.24	50.00	32.70	98.00	93.00	76.00	68.00	60.00	BTA1	43	21	8	2	0.5	0.5	0.5	0.941	BTA1	3	0.5	69	28	0.5	2.52
BTA2	-45.75	1748.91	1852.70	32.00	94.00	85.00	59.00	48.00	39.00	BTA2	25	10	4	0.5	0.5	0.5	0.5	0.402	BTA2	6	0.5	80	14	0.5	2.54
BTA3	-45.75	86.37	100.00	34.10	97.00	92.00	71.00	63.00	55.00	BTA3	37	18	6	1	0.5	0.5	0.5	0.761	BTA3	3	0.5	73	24	0.5	2.49
BTA4	-44.00	728.82	1637.83	37.90	94.00	83.00	52.00	43.00	36.00	BTA4	25	11	4	0.5	0.5	0.5	0.5	0.328	BTA4	6	0.5	79	15	0.5	2.55
BTA5	-45.00	112.32	111.80	35.10	94.00	86.00	58.00	48.00	39.00	BTA5	23	8	2	1	0.5	0.5	0.5	0.4	BTA5	6	0.5	82	12	0.5	2.46
BTA6	-45.75	212.05	206.16	38.80	94.00	81.00	51.00	41.00	34.00	BTA6	20	7	2	0.5	0.5	0.5	0.5	0.313	BTA6	6	0.5	83	11	0.5	2.47
BTA7	-45.75	1029.29	1030.78	33.50	90.00	79.00	46.00	36.00	30.00	BTA7	19	8	3	0.5	0.5	0.5	0.5	0.282	BTA7	10	0.5	79	11	0.5	2.48
BTA8	-45.00	208.43	212.13	29.80	94.00	82.00	58.00	52.00	44.00	BTA8	31	16	7	3	0.5	0.5	0.5	0.469	BTA8	6	0.5	74	20	0.5	2.53
BTA9	-46.25	1248.07	1756.42	34.40	92.00	81.00	47.00	38.00	31.00	BTA9	19	8	3	0.5	0.5	0.5	0.5	0.287	BTA9	8	0.5	81	11	0.5	2.48
BTA10	-45.00	795.66	1665.08	34.70	93.00	77.00	45.00	38.00	33.00	BTA10	24	12	6	2	0.5	0.5	0.5	0.277	BTA10	7	0.5	77	16	0.5	2.47
BTA12	-44.75	919.19	934.08	40.80	95.00	88.00	61.00	52.00	44.00	BTA12	28	10	4	0.5	0.5	0.5	0.5	0.464	BTA12	5	0.5	80	15	0.5	2.46
BTA13	-45.75	69.00	70.71	35.40	99.00	85.00	48.00	36.00	27.00	BTA13	16	7	2	0.5	0.5	0.5	0.5	0.292	BTA13	1	0.5	89	10	0.5	2.49
BTA14	-45.00	657.77	860.23	41.00	93.00	84.00	57.00	49.00	42.00	BTA14	30	12	7	5	0.5	0.5	0.5	0.409	BTA14	7	0.5	75	18	0.5	2.57
BTA15	-44.75	232.20	250.00	39.10	97.00	83.00	49.00	38.00	29.00	BTA15	17	7	3	1	0.5	0.5	0.5	0.296	BTA15	3	0.5	87	10	0.5	2.47
BTA16	-45.75	56.22	50.00	36.10	97.00	93.00	73.00	60.00	47.00	BTA16	24	6	2	0.5	0.5	0.5	0.5	0.56	BTA16	3	0.5	86	11	0.5	2.47
BTA17	-45.75	138.75	141.42	33.80	96.00	84.00	54.00	46.00	38.00	BTA17	26	13	5	0.5	0.5	0.5	0.5	0.363	BTA17	3	0.5	80	17	0.5	2.51
BTA18	-45.50	1148.54	1166.19	35.70	91.00	81.00	53.00	46.00	41.00	BTA18	32	23	18	9	0.5	0.5	0.5	0.354	BTA18	9	0.5	65	26	0.5	2.49
BTA20	-45.75	890.25	1073.55	36.70	91.00	76.00	42.00	32.00	24.00	BTA20	13	4	0.5	0.5	0.5	0.5	0.5	0.265	BTA20	9	0.5	85	6	0.5	2.45
BTA21	-45.75	88.96	100.00	32.20	95.00	88.00	65.00	55.00	47.00	BTA21	31	14	7	0.5	0.5	0.5	0.5	0.534	BTA21	5	0.5	76	19	0.5	2.57
BTA22	-44.00	307.58	316.23	33.80	92.00	82.00	59.00	52.00	45.00	BTA22	32	14	6	1	0.5	0.5	0.5	0.475	BTA22	8	0.5	72	20	0.5	2.56
BTA23	-45.75	52.46	70.71	33.40	96.00	83.00	34.00	24.00	17.00	BTA23	7	2	0.5	0.5	0.5	0.5	0.5	0.251	BTA23	4	0.5	93	3	0.5	2.49
BTA24	-46.00	1283.35	1323.82	34.90	94.00	80.00	47.00	36.00	27.00	BTA24	15	4	0.5	0.5	0.5	0.5	0.5	0.286	BTA24	6	0.5	86	8	0.5	2.46
BTA25	-45.75	80.49	70.71	36.60	96.00	86.00	54.00	42.00	34.00	BTA25	19	7	2	0.5	0.5	0.5	0.5	0.342	BTA25	4	0.5	86	10	0.5	2.6
BTA26	-44.00	706.41	715.89	32.10	90.00	80.00	62.00	57.00	52.00	BTA26	43	26	14	5	0.5	0.5	0.5	0.729	BTA26	10	0.5	59	31	0.5	2.48
BTA37	-45.75	138.75	141.42	31.20	96.00	88.00	60.00	51.00	43.00	BTA37	28	12	3	0.5	0.5	0.5	0.5	0.447	BTA37	4	0.5	79	17	0.5	2.51
BTA38	-45.75	138.75	141.42	30.50	95.00	86.00	66.00	59.00	53.00	BTA38	41	24	14	9	0.5	0.5	0.5	0.745	BTA38	5	0.5	66	29	0.5	2.51
BTA39	-45.75	212.05	206.16	30.60	94.00	83.00	53.00	44.00	36.00	BTA39	22	8	3	0.5	0.5	0.5	0.5	0.342	BTA39	6	0.5	82	12	0.5	2.49
BTA40	-45.75	212.05	206.16	37.40	94.00	79.00	65.00	39.00	32.00	BTA40	20	7	2	0.5	0.5	0.5	0.5	0.372	BTA40	6	0.5	83	11	0.5	2.49
BTA41	-44.00	728.82	1637.83	33.40	85.00	72.00	42.00	35.00	30.00	BTA41	22	10	3	0.5	0.5	0.5	0.5	0.261	BTA41	15	0.5	72	13	0.5	2.5
BTA42	-44.00	728.82	1637.83	30.70	93.00	81.00	54.00	46.00	40.00	BTA42	29	14	6	0.5	0.5	0.5	0.5	0.363	BTA42	7	0.5	75	18	0.5	2.54

SampleID_	MedianPS	Nitrite + Ni	Total Kjelda	Total Nitro	Total Phosp	Total Orgar	Total Carbo	Total Inorganic Carbon		
BTA1	0.941	2.6	350	350	533	0.53	10.1	9.57		
BTA2	0.402	0.6	410	410	581	0.25	9.52	9.27		
BTA3	0.761	1.6	410	410	632	0.36	9.47	9.11		
BTA4	0.328	0.3	280	280	394	0.19	7.6	7.41		
BTA5	0.4	1	390	390	447	0.26	10	9.74		
BTA6	0.313	1.5	530	530	572	0.23	9.6	9.37		
BTA7	0.282	1.2	490	490	496	0.26	9.64	9.38		
BTA8	0.469	0.8	350	350	463	0.25	9.22	8.97		
BTA9	0.287	1.1	420	420	489	0.1	9.1	9		
BTA10	0.277	0.4	460	460	466	0.26	9.85	9.59		
BTA12	0.464	0.3	380	380	575	0.23	9.58	9.35		
BTA13	0.292	0.9	270	270	503	0.19	8.36	8.17		
BTA14	0.409	0.2	340	340	342	0.25	10	9.75		
BTA15	0.296	0.4	360	360	552	0.31	9.14	8.83		
BTA16	0.56	7.9	450	460	1030	0.34	10.3	9.96		
BTA17	0.363	0.2	300	300	473	0.24	9.06	8.82		
BTA18	0.354	0.3	380	380	392	0.32	9.7	9.38		
BTA20	0.265	0.2	290	290	438	0.25	9.54	9.29		
BTA21	0.534	2.4	340	340	450	0.3	9.04	8.74		
BTA22	0.475	0.1	360	360	361	0.32	9.92	9.6		
BTA23	0.251	2.4	470	470	1490	0.46	8.87	8.41		
BTA24	0.286	0.1	320	320	494	0.26	9.48	9.22		
BTA25	0.342	1	380	380	585	0.33	8.07	7.74		
BTA26	0.729	0.1	600	600	451	0.22	9.52	9.3		
BTA37	0.447	0.6	360	360	530	0.22	9.88	9.66		
BTA38	0.745	0.3	390	390	450	0.29	9.51	9.22		
BTA39	0.342	0.2	360	360	444	0.25	9.92	9.67		
BTA40	0.372	0.3	440	440	486	0.33	8.58	8.25		
BTA41	0.261	0.1	560	560	469	0.23	8.09	7.86		
BTA42	0.363	0.2	370	370	406	0.14	7.59	7.45		

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum
CBA1	0.13	2.5	2.5	2	2	2	2	2	2	2	CBA1	0.13	2	2	2	2	2	2	2	CBA1	0.13	2	2	2	2.5	2
CBA2	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA2	0.11	NA	NA	NA	NA	NA	NA	NA	CBA2	0.11	NA	NA	NA	NA	NA
CBA3	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA3	0.12	NA	NA	NA	NA	NA	NA	NA	CBA3	0.12	NA	NA	NA	NA	NA
CBA4	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA4	0.12	NA	NA	NA	NA	NA	NA	NA	CBA4	0.12	NA	NA	NA	NA	NA
CBA5	0.13	2.5	2.5	2	2	2	2	2	2	2	CBA5	0.13	2	2	2	2	2	2	2	CBA5	0.13	2	2	2	2.5	2
CBA6	0.15	2.5	2.5	2	2	2	2	2	2	2	CBA6	0.15	2	2	2	2	2	2	2	CBA6	0.15	2	2	2	2.5	2
CBA7	0.12	2.5	2.5	2	2	2	2	2	2	2	CBA7	0.12	2	2	2	2	2	2	2	CBA7	0.12	2	2	2	2.5	2
CBA8	0.1	2.5	2.5	2	2	2	2	2	2	2	CBA8	0.1	2	2	2	2	2	2	2	CBA8	0.1	2	2	2	2.5	2
CBA9	0.1	2.5	2.5	2	2	2	2	2	2	2	CBA9	0.1	2	2	2	2	2	2	2	CBA9	0.1	2	2	2	2.5	2
CBA10	0.11	2.5	2.5	2	2	2	2	2	2	2	CBA10	0.11	2	2	2	2	2	2	2	CBA10	0.11	2	2	2	2.5	2
CBA11	0.11	2.5	2.5	2	2	2	2	2	2	2	CBA11	0.11	2	2	2	2	2	2	2	CBA11	0.11	2	2	2	2.5	2
CBA12	0.16	2.5	2.5	2	2	2	2	2	2	2	CBA12	0.16	2	2	2	2	2	2	2	CBA12	0.16	2	2	2	2.5	2
CBA13	0.1	2.5	2.5	2	2	2	2	2	2	2	CBA13	0.1	2	2	2	2	2	2	2	CBA13	0.1	2	2	2	2.5	2
CBA14	0.09	2.5	2.5	2	2	2	2	2	2	2	CBA14	0.09	2	2	2	2	2	2	2	CBA14	0.09	2	2	2	2.5	2
CBA15	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA15	0.16	NA	NA	NA	NA	NA	NA	NA	CBA15	0.16	NA	NA	NA	NA	NA
CBA16	0.14	2.5	2.5	2	2	2	2	2	2	2	CBA16	0.14	2	2	2	2	2	2	2	CBA16	0.14	2	2	2	2.5	2
CBA17	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA17	0.11	NA	NA	NA	NA	NA	NA	NA	CBA17	0.11	NA	NA	NA	NA	NA
CBA18	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA18	0.14	NA	NA	NA	NA	NA	NA	NA	CBA18	0.14	NA	NA	NA	NA	NA
CBA19	0.15	2.5	2.5	2	2	2	2	2	2	2	CBA19	0.15	2	2	2	2	2	2	2	CBA19	0.15	2	2	2	2.5	2
CBA20	0.16	2.5	2.5	2	2	2	2	2	2	2	CBA20	0.16	2	2	2	2	2	2	2	CBA20	0.16	2	2	2	2.5	2
CBA21	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA21	0.15	NA	NA	NA	NA	NA	NA	NA	CBA21	0.15	NA	NA	NA	NA	NA
CBA23	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA23	0.12	NA	NA	NA	NA	NA	NA	NA	CBA23	0.12	NA	NA	NA	NA	NA
CBA24	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA24	0.12	NA	NA	NA	NA	NA	NA	NA	CBA24	0.12	NA	NA	NA	NA	NA
CBA25	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA25	0.12	NA	NA	NA	NA	NA	NA	NA	CBA25	0.12	NA	NA	NA	NA	NA
CBA37	0.13	2.5	2.5	2	2	2	2	2	2	2	CBA37	0.13	2	2	2	2	2	2	2	CBA37	0.13	2	2	2	2.5	2
CBA38	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA38	0.13	NA	NA	NA	NA	NA	NA	NA	CBA38	0.13	NA	NA	NA	NA	NA
CBA39	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA39	0.12	NA	NA	NA	NA	NA	NA	NA	CBA39	0.12	NA	NA	NA	NA	NA
CBA40	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA40	0.11	NA	NA	NA	NA	NA	NA	NA	CBA40	0.11	NA	NA	NA	NA	NA

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum
CBA1	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	CBA1	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	CBA1	0.13	15.38	15.38	15.38	19.23	15.38
CBA2	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA2	0.11	NA	NA	NA	NA	NA	NA	NA	CBA2	0.11	NA	NA	NA	NA	NA
CBA3	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA3	0.12	NA	NA	NA	NA	NA	NA	NA	CBA3	0.12	NA	NA	NA	NA	NA
CBA4	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA4	0.12	NA	NA	NA	NA	NA	NA	NA	CBA4	0.12	NA	NA	NA	NA	NA
CBA5	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	CBA5	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	CBA5	0.13	15.38	15.38	15.38	19.23	15.38
CBA6	0.15	16.67	16.67	13.33	13.33	13.33	13.33	13.33	13.33	13.33	CBA6	0.15	13.33	13.33	13.33	13.33	13.33	13.33	13.33	CBA6	0.15	13.33	13.33	13.33	16.67	13.33
CBA7	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67	CBA7	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67	CBA7	0.12	16.67	16.67	16.67	20.83	16.67
CBA8	0.10	25.00	25.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	CBA8	0.10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	CBA8	0.10	20.00	20.00	20.00	25.00	20.00
CBA9	0.10	25.00	25.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	CBA9	0.10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	CBA9	0.10	20.00	20.00	20.00	25.00	20.00
CBA10	0.11	22.73	22.73	18.18	18.18	18.18	18.18	18.18	18.18	18.18	CBA10	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18	CBA10	0.11	18.18	18.18	18.18	22.73	18.18
CBA11	0.11	22.73	22.73	18.18	18.18	18.18	18.18	18.18	18.18	18.18	CBA11	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18	CBA11	0.11	18.18	18.18	18.18	22.73	18.18
CBA12	0.16	15.63	15.63	12.50	12.50	12.50	12.50	12.50	12.50	12.50	CBA12	0.16	12.50	12.50	12.50	12.50	12.50	12.50	12.50	CBA12	0.16	12.50	12.50	12.50	15.63	12.50
CBA13	0.10	25.00	25.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	CBA13	0.10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	CBA13	0.10	20.00	20.00	20.00	25.00	20.00
CBA14	0.09	27.78	27.78	22.22	22.22	22.22	22.22	22.22	22.22	22.22	CBA14	0.09	22.22	22.22	22.22	22.22	22.22	22.22	22.22	CBA14	0.09	22.22	22.22	22.22	27.78	22.22
CBA15	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA15	0.16	NA	NA	NA	NA	NA	NA	NA	CBA15	0.16	NA	NA	NA	NA	NA
CBA16	0.14	17.86	17.86	14.29	14.29	14.29	14.29	14.29	14.29	14.29	CBA16	0.14	14.29	14.29	14.29	14.29	14.29	14.29	14.29	CBA16	0.14	14.29	14.29	14.29	17.86	14.29
CBA17	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA17	0.11	NA	NA	NA	NA	NA	NA	NA	CBA17	0.11	NA	NA	NA	NA	NA
CBA18	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA18	0.14	NA	NA	NA	NA	NA	NA	NA	CBA18	0.14	NA	NA	NA	NA	NA
CBA19	0.15	16.67	16.67	13.33	13.33	13.33	13.33	13.33	13.33	13.33	CBA19	0.15	13.33	13.33	13.33	13.33	13.33	13.33	13.33	CBA19	0.15	13.33	13.33	13.33	16.67	13.33
CBA20	0.16	15.63	15.63	12.50	12.50	12.50	12.50	12.50	12.50	12.50	CBA20	0.16	12.50	12.50	12.50	12.50	12.50	12.50	12.50	CBA20	0.16	12.50	12.50	12.50	15.63	12.50
CBA21	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA21	0.15	NA	NA	NA	NA	NA	NA	NA	CBA21	0.15	NA	NA	NA	NA	NA
CBA23	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA23	0.12	NA	NA	NA	NA	NA	NA	NA	CBA23	0.12	NA	NA	NA	NA	NA
CBA24	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA24	0.12	NA	NA	NA	NA	NA	NA	NA	CBA24	0.12	NA	NA	NA	NA	NA
CBA25	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA25	0.12	NA	NA	NA	NA	NA	NA	NA	CBA25	0.12	NA	NA	NA	NA	NA
CBA37	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	CBA37	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	CBA37	0.13	15.38	15.38	15.38	19.23	15.38
CBA38	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA38	0.13	NA	NA	NA	NA	NA	NA	NA	CBA38	0.13	NA	NA	NA	NA	NA
CBA39	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA39	0.12	NA	NA	NA	NA	NA	NA	NA	CBA39	0.12	NA	NA	NA	NA	NA
CBA40	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	CBA40	0.11	NA	NA	NA	NA	NA	NA	NA	CBA40	0.11	NA	NA	NA	NA	NA

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	SampleID_	Lead	Manganes	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	Methyl me	GrossAlpha	GrossBeta
CBA1	430	2750	10	0.25	7.73	0.05	8.5	0.5	0.25	CBA1	1.1	35	1.2	0.05	0.05	10.8	2.7	0.005	NA	NA	NA
CBA2	500	3510	5	0.51	10.9	0.05	10.4	0.5	0.25	CBA2	1.1	42	1.1	0.05	0.05	14.8	1.9	0.005	NA	NA	NA
CBA3	740	4290	20	0.5	10.7	0.05	11.4	0.5	0.25	CBA3	1.2	39	2	0.05	0.05	17.4	4.4	0.005	NA	NA	NA
CBA4	500	3440	20	0.25	9.62	0.05	10.2	0.5	0.25	CBA4	1.2	35	1.2	0.05	0.05	13.6	5.8	0.005	NA	250	250
CBA5	580	4000	5	0.58	12	0.05	10.6	0.5	0.25	CBA5	1.3	53	1.5	0.05	0.05	16.1	2.4	0.005	NA	NA	NA
CBA6	560	3180	5	0.25	7.86	0.05	8.6	0.5	0.25	CBA6	1	43	1.5	0.05	0.05	12.7	6.9	0.005	NA	NA	NA
CBA7	620	3760	10	0.51	9.64	0.05	10.1	0.5	0.25	CBA7	1	38	1.8	0.05	0.05	15.7	6.6	0.005	NA	780	250
CBA8	580	3370	5	0.55	9.97	0.05	10.5	0.5	0.25	CBA8	1.1	36	1.3	0.05	0.05	13.6	2.6	0.005	NA	NA	NA
CBA9	490	3350	40	0.25	9.2	0.05	10.3	0.5	0.25	CBA9	1.2	40	1.1	0.05	0.05	13	2.7	0.005	NA	NA	NA
CBA10	490	3250	5	0.25	8.77	0.05	8.9	0.5	0.25	CBA10	1.2	46	1.1	0.05	0.05	12.2	1.9	0.005	NA	NA	NA
CBA11	520	3610	30	0.25	10.2	0.05	11	0.5	0.25	CBA11	1.2	40	1.2	0.05	0.05	14.7	15.3	0.005	NA	250	250
CBA12	560	3360	20	0.25	9.23	0.1	10.1	0.5	0.25	CBA12	1.4	41	1.5	0.05	0.05	12.7	3.2	0.005	NA	NA	NA
CBA13	450	3020	80	0.25	8.63	0.05	9	1.5	0.25	CBA13	1	33	0.5	0.05	0.05	12.3	4.4	0.005	NA	250	250
CBA14	420	3270	10	0.25	8.52	0.05	8.8	0.5	0.25	CBA14	0.5	27	0.5	0.05	0.05	11.8	4.8	0.005	NA	250	250
CBA15	660	3700	5	0.25	9.45	0.05	8.6	0.5	0.25	CBA15	1.2	33	1.9	0.05	0.05	15	3.3	0.005	NA	NA	NA
CBA16	550	8250	10	0.25	8.91	0.05	9.6	1.8	0.25	CBA16	2.3	58	1.9	0.05	0.05	13.7	108	0.005	NA	250	250
CBA17	760	4830	40	0.55	13.2	0.05	12.2	0.5	0.6	CBA17	1.4	44	1.8	0.1	0.05	17	6	0.005	NA	250	250
CBA18	640	3780	5	0.25	12.9	0.05	12.3	0.5	0.25	CBA18	1.1	53	1.4	0.1	0.05	16.3	2.3	0.005	NA	NA	NA
CBA19	650	4200	5	0.69	15.9	0.05	14.7	0.5	0.25	CBA19	1.2	42	1.8	0.05	0.05	20.3	2.7	0.005	NA	NA	NA
CBA20	620	3590	30	0.54	12	0.05	11.8	0.5	0.25	CBA20	1.1	46	1.5	0.1	0.05	16.1	2.3	0.005	NA	NA	NA
CBA21	580	3460	40	0.55	10.9	0.05	11.2	0.5	0.25	CBA21	1	38	1.3	0.05	0.05	15.3	2.2	0.005	NA	NA	NA
CBA23	580	3760	20	0.53	12.2	0.05	11.7	0.5	0.25	CBA23	1.2	41	1.2	0.1	0.05	17	3.5	0.005	NA	NA	NA
CBA24	640	4300	10	0.52	11.7	0.05	11.2	0.5	0.25	CBA24	1.1	34	1.4	0.1	0.05	16	6	0.005	NA	250	250
CBA25	640	4070	10	0.51	12.5	0.05	12.3	0.5	0.25	CBA25	1.3	48	1.5	0.1	0.05	16.8	2.6	0.005	NA	250	250
CBA37	560	3740	5	0.52	11.1	0.05	11	0.5	0.25	CBA37	0.5	33	1.2	0.05	0.05	15.4	2	0.005	NA	NA	NA
CBA38	680	4300	5	0.54	11.4	0.05	11.7	0.5	0.25	CBA38	1.1	38	1.4	0.05	0.05	15.6	2.4	0.005	NA	NA	NA
CBA39	700	4550	5	0.56	13.3	0.05	11.9	0.5	0.25	CBA39	1.2	42	1.3	0.05	0.05	17.9	2.2	0.005	NA	NA	NA
CBA40	650	4340	5	0.56	13	0.05	12.4	0.5	0.25	CBA40	1.1	45	1.3	0.05	0.05	16.9	1.9	0.005	NA	NA	NA

SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plu	PS2360plu	PS4750plu	PS9500plu	PS19000pl	PS37500pl	PS75000pl	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
CBA1	-77	322.43	350.00	23.9	97	95	73	56	43	CBA1	26	14	9	6	0.5	0.5	0.5	0.506	CBA1	3	0.5	79	18	0.5	2.61
CBA2	-77.25	336.10	1151.09	27	98	98	89	65	41	CBA2	11	2	0.5	0.5	0.5	0.5	0.5	0.534	CBA2	2	0.5	93	5	0.5	2.63
CBA3	-77	225.55	316.23	22.7	99	99	81	55	35	CBA3	10	2	0.5	0.5	0.5	0.5	0.5	0.469	CBA3	1	0.5	95	4	0.5	2.56
CBA4	-77	46.78	150.00	22.5	96	95	76	57	42	CBA4	23	10	4	1	0.5	0.5	0.5	0.507	CBA4	4	0.5	82	14	0.5	2.61
CBA5	-77	489.56	471.70	24.7	98	98	88	67	46	CBA5	15	3	0.5	0.5	0.5	0.5	0.5	0.567	CBA5	2	0.5	91	7	0.5	2.62
CBA6	-77.5	801.09	1553.22	23.2	98	97	79	50	28	CBA6	8	1	0.5	0.5	0.5	0.5	0.5	0.425	CBA6	2	0.5	95	3	0.5	2.57
CBA7	-77	88.16	70.71	20.3	99	98	84	63	47	CBA7	26	12	0.5	0.5	0.5	0.5	0.5	0.567	CBA7	1	0.5	83	16	0.5	2.6
CBA8	-76	1004.22	1110.18	21.1	98	96	78	57	40	CBA8	20	8	3	0.5	0.5	0.5	0.5	0.497	CBA8	2	0.5	86	12	0.5	2.65
CBA9	-77	286.42	291.55	22.7	98	96	73	47	31	CBA9	12	3	0.5	0.5	0.5	0.5	0.5	0.411	CBA9	2	0.5	92	6	0.5	2.62
CBA10	-80.5	1535.68	1518.22	22	98	96	84	64	44	CBA10	21	8	4	2	0.5	0.5	0.5	0.548	CBA10	2	0.5	86	12	0.5	2.66
CBA11	-77	72.90	100.00	25.7	98	98	85	64	45	CBA11	16	4	1	0.5	0.5	0.5	0.5	0.554	CBA11	2	0.5	90	8	0.5	2.61
CBA12	-76	451.35	474.34	32.1	94	89	58	40	29	CBA12	15	8	4	0.5	0.5	0.5	0.5	0.356	CBA12	6	0.5	84	10	0.5	2.61
CBA13	-77	127.44	111.80	25.5	98	96	84	65	50	CBA13	28	15	10	6	0.5	0.5	0.5	0.6	CBA13	2	0.5	79	19	0.5	2.66
CBA14	-77	165.21	150.00	24.3	98	97	80	59	44	CBA14	23	9	2	0.5	0.5	0.5	0.5	0.53	CBA14	2	0.5	85	13	0.5	2.67
CBA15	-76	848.86	886.00	31.7	99	98	75	55	38	CBA15	14	5	0.5	0.5	0.5	0.5	0.5	0.476	CBA15	1	0.5	91	8	0.5	2.52
CBA16	-77	113.92	141.42	22.3	98	97	77	57	41	CBA16	19	5	0.5	0.5	0.5	0.5	0.5	0.502	CBA16	2	0.5	89	9	0.5	2.67
CBA17	-77	176.02	206.16	23.2	98	97	75	54	38	CBA17	20	10	5	0.5	0.5	0.5	0.5	0.466	CBA17	2	0.5	85	13	0.5	2.67
CBA18	-80.5	1967.92	1950.00	21.5	99	99	85	56	33	CBA18	10	3	1	0.5	0.5	0.5	0.5	0.471	CBA18	1	0.5	94	5	0.5	2.68
CBA19	-74	1648.87	1732.77	26	99	98	87	66	43	CBA19	16	4	0.5	0.5	0.5	0.5	0.5	0.547	CBA19	1	0.5	91	8	0.5	2.65
CBA20	-77	395.74	380.79	22.2	98	97	81	56	36	CBA20	13	3	0.5	0.5	0.5	0.5	0.5	0.471	CBA20	2	0.5	92	6	0.5	2.68
CBA21	-77	409.91	400.00	23.3	98	96	77	52	34	CBA21	14	4	1	0.5	0.5	0.5	0.5	0.444	CBA21	2	0.5	91	7	0.5	2.63
CBA23	-77	333.51	316.23	23.1	98	98	88	64	41	CBA23	13	2	0.5	0.5	0.5	0.5	0.5	0.532	CBA23	2	0.5	92	6	0.5	2.68
CBA24	-77	63.02	70.71	22.9	99	98	86	66	47	CBA24	18	4	1	0.5	0.5	0.5	0.5	0.572	CBA24	1	0.5	91	8	0.5	2.61
CBA25	-77.25	1358.67	1415.98	25.3	99	98	80	54	32	CBA25	11	3	0.5	0.5	0.5	0.5	0.5	0.457	CBA25	1	0.5	94	5	0.5	2.65
CBA37	-76	1004.22	1110.18	25.4	98	97	77	52	35	CBA37	15	6	1	0.5	0.5	0.5	0.5	0.446	CBA37	2	0.5	90	8	0.5	2.64
CBA38	-76	1004.22	1110.18	23.7	98	96	73	51	34	CBA38	16	7	2	0.5	0.5	0.5	0.5	0.435	CBA38	1	0.5	89	10	0.5	2.64
CBA39	-77.25	336.10	1151.09	23.4	99	98	89	66	43	CBA39	12	3	0.5	0.5	0.5	0.5	0.5	0.547	CBA39	1	0.5	93	6	0.5	2.63
CBA40	-77.25	336.10	1151.09	22.2	99	98	86	62	39	CBA40	14	5	2	0.5	0.5	0.5	0.5	0.516	CBA40	1	0.5	91	8	0.5	2.63

SampleID_	MedianPS	Nitrite + Ni	Total Kjelda	Total Nitro	Total Phosp	Total Orgar	Total Carbo	Total Inorganic Carbon		
CBA1	0.506	0.2	180	180	316	0.13	8.38	8.25		
CBA2	0.534	0.2	130	130	658	0.11	8.02	7.91		
CBA3	0.469	0.5	110	110	396	0.12	7.69	7.57		
CBA4	0.507	0.1	140	140	458	0.12	7.43	7.31		
CBA5	0.567	0.5	130	130	457	0.13	8.04	7.91		
CBA6	0.425	0.05	160	160	388	0.15	5.88	5.73		
CBA7	0.567	0.2	130	130	428	0.12	8.13	8.01		
CBA8	0.497	0.2	100	100	342	0.1	7.29	7.19		
CBA9	0.411	0.4	210	210	382	0.1	7.35	7.25		
CBA10	0.548	0.1	150	150	363	0.11	8	7.89		
CBA11	0.554	2.1	160	160	400	0.11	8.1	7.99		
CBA12	0.356	0.3	300	300	290	0.16	8.81	8.65		
CBA13	0.6	0.6	110	110	462	0.1	7.95	7.85		
CBA14	0.53	0.3	130	130	484	0.09	7.59	7.5		
CBA15	0.476	0.2	370	370	414	0.16	6.16	6		
CBA16	0.502	0.2	140	140	534	0.14	7.5	7.36		
CBA17	0.466	0.05	120	120	385	0.11	7.44	7.33		
CBA18	0.471	0.2	130	130	364	0.14	7.98	7.84		
CBA19	0.547	1.1	210	210	459	0.15	8.08	7.93		
CBA20	0.471	0.2	110	110	321	0.16	7.72	7.56		
CBA21	0.444	0.2	110	110	360	0.15	7.55	7.4		
CBA23	0.532	0.1	130	130	369	0.12	8.04	7.92		
CBA24	0.572	1.4	160	160	657	0.12	7.84	7.72		
CBA25	0.457	0.3	120	120	354	0.12	7.92	7.8		
CBA37	0.446	0.05	120	120	239	0.13	7.22	7.09		
CBA38	0.435	0.4	210	210	426	0.13	7.18	7.05		
CBA39	0.547	0.1	140	140	838	0.12	7.55	7.43		
CBA40	0.516	0.4	150	150	420	0.11	7.32	7.21		

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene
DPA1	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA2	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA3	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA4	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA5	0.16	2.5	2.5	2	2	2	2	2	2	2
DPA6	0.13	2.5	2.5	2	2	2	2	2	2	2
DPA7	0.15	2.5	2.5	2	2	2	2	2	2	2
DPA8	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA9	0.24	2.5	2.5	2	2	2	2	2	2	2
DPA10	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA11	0.24	2.5	2.5	2	2	2	2	2	2	2
DPA12	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA13	0.13	2.5	2.5	2	2	2	2	2	2	2
DPA14	0.08	2.5	2.5	2	2	2	2	2	2	2
DPA15	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA16	0.1	2.5	2.5	2	2	2	2	2	2	2
DPA17	0.12	2.5	2.5	2	2	2	2	2	2	2
DPA18	0.12	2.5	2.5	2	2	2	2	2	2	2
DPA19	0.11	2.5	2.5	2	2	2	2	2	2	2
DPA19B	0.12	2.5	2.5	2	2	2	2	2	2	2
DPA20	0.15	2.5	2.5	2	2	2	2	2	2	2
DPA21	0.11	2.5	2.5	2	2	2	2	2	2	2
DPA22	0.09	2.5	2.5	2	2	2	2	2	2	2
DPA23	0.13	2.5	2.5	2	2	2	2	2	2	2
DPA24	0.24	2.5	2.5	2	2	2	2	2	2	2
DPA37	0.12	2.5	2.5	2	2	2	2	2	2	2
DPA38	0.12	2.5	2.5	2	2	2	2	2	2	2
DPA39	0.13	2.5	2.5	2	2	2	2	2	2	2
DPA40	0.17	2.5	2.5	2	2	2	2	2	2	2
DPA41	0.18	2.5	2.5	2	2	2	2	2	2	2
DPA42	0.17	2.5	2.5	2	2	2	2	2	2	2

SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene
DPA1	0.13	NA	NA	NA	NA	NA	NA	NA
DPA2	0.1	NA	NA	NA	NA	NA	NA	NA
DPA3	0.18	NA	NA	NA	NA	NA	NA	NA
DPA4	0.14	NA	NA	NA	NA	NA	NA	NA
DPA5	0.16	2	2	2	2	2	2	2
DPA6	0.13	2	2	2	2	2	2	2
DPA7	0.15	2	2	2	2	2	2	2
DPA8	0.14	NA	NA	NA	NA	NA	NA	NA
DPA9	0.24	2	2	2	2	2	2	2
DPA10	0.15	NA	NA	NA	NA	NA	NA	NA
DPA11	0.24	2	2	2	2	2	2	2
DPA12	0.11	NA	NA	NA	NA	NA	NA	NA
DPA13	0.13	2	2	2	2	2	2	2
DPA14	0.08	2	2	2	2	2	2	2
DPA15	0.15	NA	NA	NA	NA	NA	NA	NA
DPA16	0.1	2	2	2	2	2	2	2
DPA17	0.12	2	2	2	2	2	2	2
DPA18	0.12	2	2	2	2	2	2	2
DPA19	0.11	2	2	2	2	2	2	2
DPA19B	0.12	2	2	2	2	2	2	2
DPA20	0.15	2	2	2	2	2	2	2
DPA21	0.11	2	2	2	2	2	2	2
DPA22	0.09	2	2	2	2	2	2	2
DPA23	0.13	2	2	2	2	2	2	2
DPA24	0.24	2	2	2	2	2	2	2
DPA37	0.12	2	2	2	2	2	2	2
DPA38	0.12	2	2	2	2	2	2	2
DPA39	0.13	2	2	2	2	2	2	2
DPA40	0.17	2	2	2	2	2	2	2
DPA41	0.18	2	2	2	2	2	2	2
DPA42	0.17	2	2	2	2	2	2	2

SampleID_	Total Orga	BenzoghiPe	DibenzahA	Indeno1.2.	Coronene	PAHsum
DPA1	0.13	NA	NA	NA	NA	NA
DPA2	0.1	NA	NA	NA	NA	NA
DPA3	0.18	NA	NA	NA	NA	NA
DPA4	0.14	NA	NA	NA	NA	NA
DPA5	0.16	2	2	2	2.5	2
DPA6	0.13	2	2	2	2.5	2
DPA7	0.15	2	2	2	2.5	2
DPA8	0.14	NA	NA	NA	NA	NA
DPA9	0.24	2	2	2	2.5	2
DPA10	0.15	NA	NA	NA	NA	NA
DPA11	0.24	2	2	2	2.5	2
DPA12	0.11	NA	NA	NA	NA	NA
DPA13	0.13	2	2	2	2.5	2
DPA14	0.08	2	2	2	2.5	2
DPA15	0.15	NA	NA	NA	NA	NA
DPA16	0.1	2	2	2	2.5	2
DPA17	0.12	2	2	2	2.5	2
DPA18	0.12	2	2	2	2.5	2
DPA19	0.11	2	2	2	2.5	2
DPA19B	0.12	2	2	2	2.5	2
DPA20	0.15	2	2	2	2.5	2
DPA21	0.11	2	2	2	2.5	2
DPA22	0.09	2	2	2	2.5	2
DPA23	0.13	2	2	2	2.5	2
DPA24	0.24	2	2	2	2.5	2
DPA37	0.12	2	2	2	2.5	2
DPA38	0.12	2	2	2	2.5	2
DPA39	0.13	2	2	2	2.5	2
DPA40	0.17	2	2	2	2.5	2
DPA41	0.18	2	2	2	2.5	2
DPA42	0.17	2	2	2	2.5	2

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene
DPA1	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA2	0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA3	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA4	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA5	0.16	15.63	15.63	12.50	12.50	12.50	12.50	12.50	12.50	12.50
DPA6	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38
DPA7	0.15	16.67	16.67	13.33	13.33	13.33	13.33	13.33	13.33	13.33
DPA8	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA9	0.24	10.42	10.42	8.33	8.33	8.33	8.33	8.33	8.33	8.33
DPA10	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA11	0.24	10.42	10.42	8.33	8.33	8.33	8.33	8.33	8.33	8.33
DPA12	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA13	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38
DPA14	0.08	31.25	31.25	25.00	25.00	25.00	25.00	25.00	25.00	25.00
DPA15	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA
DPA16	0.10	25.00	25.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
DPA17	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA18	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA19	0.11	22.73	22.73	18.18	18.18	18.18	18.18	18.18	18.18	18.18
DPA19B	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA20	0.15	16.67	16.67	13.33	13.33	13.33	13.33	13.33	13.33	13.33
DPA21	0.11	22.73	22.73	18.18	18.18	18.18	18.18	18.18	18.18	18.18
DPA22	0.09	27.78	27.78	22.22	22.22	22.22	22.22	22.22	22.22	22.22
DPA23	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38
DPA24	0.24	10.42	10.42	8.33	8.33	8.33	8.33	8.33	8.33	8.33
DPA37	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA38	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA39	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38
DPA40	0.17	14.71	14.71	11.76	11.76	11.76	11.76	11.76	11.76	11.76
DPA41	0.18	13.89	13.89	11.11	11.11	11.11	11.11	11.11	11.11	11.11
DPA42	0.17	14.71	14.71	11.76	11.76	11.76	11.76	11.76	11.76	11.76

SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluc	Benzoepyr	Benzoapyr	Perylene
DPA1	0.13	NA	NA	NA	NA	NA	NA	NA
DPA2	0.10	NA	NA	NA	NA	NA	NA	NA
DPA3	0.18	NA	NA	NA	NA	NA	NA	NA
DPA4	0.14	NA	NA	NA	NA	NA	NA	NA
DPA5	0.16	12.50	12.50	12.50	12.50	12.50	12.50	12.50
DPA6	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38
DPA7	0.15	13.33	13.33	13.33	13.33	13.33	13.33	13.33
DPA8	0.14	NA	NA	NA	NA	NA	NA	NA
DPA9	0.24	8.33	8.33	8.33	8.33	8.33	8.33	8.33
DPA10	0.15	NA	NA	NA	NA	NA	NA	NA
DPA11	0.24	8.33	8.33	8.33	8.33	8.33	8.33	8.33
DPA12	0.11	NA	NA	NA	NA	NA	NA	NA
DPA13	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38
DPA14	0.08	25.00	25.00	25.00	25.00	25.00	25.00	25.00
DPA15	0.15	NA	NA	NA	NA	NA	NA	NA
DPA16	0.10	20.00	20.00	20.00	20.00	20.00	20.00	20.00
DPA17	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA18	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA19	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18
DPA19B	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA20	0.15	13.33	13.33	13.33	13.33	13.33	13.33	13.33
DPA21	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18
DPA22	0.09	22.22	22.22	22.22	22.22	22.22	22.22	22.22
DPA23	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38
DPA24	0.24	8.33	8.33	8.33	8.33	8.33	8.33	8.33
DPA37	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA38	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67
DPA39	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38
DPA40	0.17	11.76	11.76	11.76	11.76	11.76	11.76	11.76
DPA41	0.18	11.11	11.11	11.11	11.11	11.11	11.11	11.11
DPA42	0.17	11.76	11.76	11.76	11.76	11.76	11.76	11.76

SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum
DPA1	0.13	NA	NA	NA	NA	NA
DPA2	0.10	NA	NA	NA	NA	NA
DPA3	0.18	NA	NA	NA	NA	NA
DPA4	0.14	NA	NA	NA	NA	NA
DPA5	0.16	12.50	12.50	12.50	15.63	12.50
DPA6	0.13	15.38	15.38	15.38	19.23	15.38
DPA7	0.15	13.33	13.33	13.33	16.67	13.33
DPA8	0.14	NA	NA	NA	NA	NA
DPA9	0.24	8.33	8.33	8.33	10.42	8.33
DPA10	0.15	NA	NA	NA	NA	NA
DPA11	0.24	8.33	8.33	8.33	10.42	8.33
DPA12	0.11	NA	NA	NA	NA	NA
DPA13	0.13	15.38	15.38	15.38	19.23	15.38
DPA14	0.08	25.00	25.00	25.00	31.25	25.00
DPA15	0.15	NA	NA	NA	NA	NA
DPA16	0.10	20.00	20.00	20.00	25.00	20.00
DPA17	0.12	16.67	16.67	16.67	20.83	16.67
DPA18	0.12	16.67	16.67	16.67	20.83	16.67
DPA19	0.11	18.18	18.18	18.18	22.73	18.18
DPA19B	0.12	16.67	16.67	16.67	20.83	16.67
DPA20	0.15	13.33	13.33	13.33	16.67	13.33
DPA21	0.11	18.18	18.18	18.18	22.73	18.18
DPA22	0.09	22.22	22.22	22.22	27.78	22.22
DPA23	0.13	15.38	15.38	15.38	19.23	15.38
DPA24	0.24	8.33	8.33	8.33	10.42	8.33
DPA37	0.12	16.67	16.67	16.67	20.83	16.67
DPA38	0.12	16.67	16.67	16.67	20.83	16.67
DPA39	0.13	15.38	15.38	15.38	19.23	15.38
DPA40	0.17	11.76	11.76	11.76	14.71	11.76
DPA41	0.18	11.11	11.11	11.11	13.89	11.11
DPA42	0.17	11.76	11.76	11.76	14.71	11.76

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	SampleID_	Lead	Manganese	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	Methyl me	GrossAlpha	GrossBeta
DPA1	1170	6150	5	0.52	21.7	0.05	13.2	0.5	0.25	DPA1	1.4	36	1.3	0.1	0.05	24.2	2.5	0.005	NA	NA	NA
DPA2	790	4780	5	0.25	20.4	0.05	11.8	0.5	0.25	DPA2	1.4	36	1.2	0.1	0.05	23.4	2	0.005	NA	250	250
DPA3	1240	6650	5	0.65	24.7	0.05	13.3	0.5	0.25	DPA3	1.5	38	1.4	0.1	0.05	28.7	2.8	0.005	NA	NA	NA
DPA4	1210	6380	5	0.54	23.6	0.05	15.1	0.5	0.25	DPA4	1.5	43	1.5	0.1	0.05	26	2.3	0.005	NA	NA	NA
DPA5	1130	6290	5	0.59	22.5	0.05	14.2	0.5	0.25	DPA5	1.4	39	1.3	0.1	0.05	24.8	2.6	0.005	NA	NA	NA
DPA6	850	4900	5	0.53	20.4	0.05	12.4	0.5	0.25	DPA6	1.2	35	1.2	0.1	0.05	22.6	1.8	0.005	NA	250	250
DPA7	1280	6390	5	0.59	23.6	0.05	14.5	0.5	0.25	DPA7	1.5	42	1.4	0.1	0.05	26.9	2.6	0.005	NA	NA	NA
DPA8	990	5740	5	0.67	21.5	0.05	13.1	0.5	0.25	DPA8	1.4	40	1.3	0.1	0.05	24.4	2.2	0.005	NA	NA	NA
DPA9	1040	6850	5	0.54	28.3	0.05	13.4	0.5	0.25	DPA9	1.5	40	1.2	0.1	0.05	26.7	2.4	0.005	NA	NA	NA
DPA10	1170	5930	5	0.56	21.3	0.05	13.9	0.5	0.25	DPA10	1.3	38	1.4	0.1	0.05	25	2.1	0.005	NA	NA	NA
DPA11	880	4910	5	0.5	20.6	0.05	12.4	0.5	0.25	DPA11	1.4	36	1.4	0.1	0.1	24.1	2.8	0.005	NA	250	250
DPA12	980	6770	5	0.66	27.2	0.05	15.2	0.5	0.25	DPA12	1.5	47	1.2	0.1	0.05	28.2	1.9	0.005	NA	NA	NA
DPA13	970	5430	5	0.59	20.3	0.05	12.6	0.5	0.25	DPA13	1.3	33	1	0.1	0.05	22.5	1.9	0.005	NA	NA	NA
DPA14	1160	5160	5	0.25	20	0.05	12.1	0.5	0.25	DPA14	1.6	42	1.7	0.2	0.1	23.3	7.4	0.005	NA	250	250
DPA15	1100	5870	5	0.25	22	0.05	13.6	0.5	0.25	DPA15	1.4	42	1.3	0.1	0.05	23.6	2.2	0.005	NA	NA	NA
DPA16	970	6010	5	0.65	21.5	0.05	14.1	0.5	0.25	DPA16	1.3	37	1.1	0.05	0.05	24.6	2	0.005	NA	NA	NA
DPA17	980	5900	5	0.55	22.1	0.05	13.4	0.5	0.25	DPA17	1.3	39	1.2	0.05	0.05	24.1	2.2	0.005	NA	250	250
DPA18	1160	6390	5	0.61	22.2	0.05	14.2	0.5	0.25	DPA18	1.5	37	1.5	0.1	0.05	26.8	2.4	0.005	NA	NA	NA
DPA19	1100	6030	5	0.71	23.6	0.05	13.1	0.5	0.25	DPA19	1.4	39	1.4	0.1	0.05	25.3	2	0.005	NA	NA	NA
DPA19B	1590	6790	5	0.25	21.1	0.05	12.4	0.5	0.25	DPA19B	1.4	41	1.7	0.2	0.05	25	2.2	0.005	NA	NA	NA
DPA20	900	4720	5	0.25	19.3	0.05	12	0.5	0.25	DPA20	1.4	33	1.5	0.1	0.05	22.2	3.3	0.005	NA	250	250
DPA21	1050	5840	5	0.25	20.4	0.05	13.5	0.5	0.25	DPA21	1.6	34	1.1	0.1	0.05	23.1	2.3	0.005	NA	NA	NA
DPA22	990	6630	5	0.62	26.8	0.05	13.4	0.5	0.25	DPA22	1.5	40	1.2	0.1	0.05	27.8	2.3	0.005	NA	NA	NA
DPA23	890	5480	5	0.64	28	0.05	11.3	0.5	0.25	DPA23	1.3	50	1.2	0.1	0.2	24	2.1	0.005	NA	250	250
DPA24	1990	6310	10	0.51	22.1	0.05	13.4	0.5	0.6	DPA24	1.9	41	2.5	0.2	0.05	25.7	3.8	0.005	NA	NA	NA
DPA37	1080	5420	5	0.61	19	0.05	12.4	0.5	0.25	DPA37	1.3	34	1.2	0.1	0.05	23	2.2	0.005	NA	NA	NA
DPA38	1180	5900	5	0.72	20.7	0.05	13.5	0.5	0.25	DPA38	1.4	36	1.1	0.1	0.05	24.3	2.3	0.005	NA	NA	NA
DPA39	970	5280	5	0.53	18.8	0.05	12.6	0.5	0.25	DPA39	1.3	32	0.5	0.05	0.05	21.2	2.1	0.005	NA	NA	NA
DPA40	1210	5750	5	0.55	20.3	0.05	13.7	0.5	0.25	DPA40	1.4	37	1.4	0.1	0.05	24	2.6	0.005	NA	NA	NA
DPA41	1100	5800	5	0.57	22.1	0.05	12.2	0.5	0.25	DPA41	1.4	35	1.2	0.1	0.05	26.3	2.5	0.005	NA	NA	NA
DPA42	1130	5920	5	0.57	22.2	0.05	12.6	0.5	0.25	DPA42	1.4	33	1.1	0.1	0.05	24.8	1.8	0.005	NA	NA	NA

SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plu	PS2360plu	PS4750plu	PS9500plu	PS19000pl	PS37500pl	PS75000pl	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
DPA1	-37	1153.47	1176.86	24.2	98	93	33	24	18	DPA1	11	5	2	0.5	0.5	0.5	0.5	0.258	DPA1	2	0.5	91	7	0.5	2.63
DPA2	-39	89.21	111.80	28.9	98	95	36	26	19	DPA2	11	5	2	0.5	0.5	0.5	0.5	0.264	DPA2	2	0.5	91	7	0.5	2.63
DPA3	-39	1456.16	1824.83	29.2	94	90	55	48	42	DPA3	30	16	8	2	0.5	0.5	0.5	0.389	DPA3	5	0.5	75	20	0.5	2.58
DPA4	-38	2021.85	2001.25	24.1	98	90	20	11	7	DPA4	3	1	0.5	0.5	0.5	0.5	0.5	0.235	DPA4	3	0.5	95	2	0.5	2.63
DPA5	-39	424.29	424.26	25.5	97	89	26	18	13	DPA5	8	4	1	0.5	0.5	0.5	0.5	0.243	DPA5	3	0.5	92	5	0.5	2.62
DPA6	-39	117.21	141.42	27.1	98	91	47	29	20	DPA6	14	7	1	0.5	0.5	0.5	0.5	0.29	DPA6	2	0.5	89	9	0.5	2.62
DPA7	-39	1160.30	1170.47	26.7	96	91	34	25	19	DPA7	11	4	2	0.5	0.5	0.5	0.5	0.258	DPA7	4	0.5	90	6	0.5	2.6
DPA8	-39	137.56	254.95	22.8	98	90	25	16	10	DPA8	5	2	0.5	0.5	0.5	0.5	0.5	0.242	DPA8	2	0.5	95	3	0.5	2.59
DPA9	-39	163.59	474.34	25.1	96	90	30	21	15	DPA9	8	5	3	1	0.5	0.5	0.5	0.25	DPA9	4	0.5	90	6	0.5	2.58
DPA10	-39	452.89	474.34	25.7	97	90	35	25	18	DPA10	9	4	2	0.5	0.5	0.5	0.5	0.259	DPA10	3	0.5	91	6	0.5	2.59
DPA11	-39	120.80	111.80	22.9	96	90	37	29	24	DPA11	18	11	7	4	0.5	0.5	0.5	0.263	DPA11	4	0.5	83	13	0.5	2.54
DPA12	-39	1712.07	1706.60	26.7	98	94	32	21	14	DPA12	6	2	1	0.5	0.5	0.5	0.5	0.256	DPA12	2	0.5	94	4	0.5	2.66
DPA13	-38	618.37	602.08	25.3	98	92	36	25	18	DPA13	8	2	0.5	0.5	0.5	0.5	0.5	0.263	DPA13	2	0.5	94	4	0.5	2.64
DPA14	-39	105.92	111.80	27.4	93	85	48	40	32	DPA14	20	8	2	0.5	0.5	0.5	0.5	0.292	DPA14	7	0.5	81	12	0.5	2.59
DPA15	-38	254.80	250.00	26.3	96	91	31	22	16	DPA15	9	4	2	0.5	0.5	0.5	0.5	0.253	DPA15	4	0.5	90	6	0.5	2.63
DPA16	-37	1704.38	1680.03	23.2	98	89	25	17	12	DPA16	8	4	3	1	0.5	0.5	0.5	0.241	DPA16	2	0.5	93	5	0.5	2.64
DPA17	-39	121.84	111.80	24.3	97	93	36	28	22	DPA17	16	10	8	8	0.5	0.5	0.5	0.263	DPA17	3	0.5	85	12	0.5	2.64
DPA18	-39	155.78	427.20	24.3	98	92	48	39	32	DPA18	23	15	13	12	0.5	0.5	0.5	0.293	DPA18	2	0.5	81	17	0.5	2.63
DPA19	-38	1543.85	1916.38	28.4	NA	NA	NA	NA	NA	DPA19	NA	NA	NA	NA	NA	NA	NA	0.27	DPA19	NA	NA	NA	NA	NA	NA
DPA19B	-38	1543.85	1916.38	34.3	95	89	36	26	20	DPA19B	12	6	3	0.5	0.5	0.5	0.5	0.26	DPA19B	5	0.5	87	8	0.5	2.59
DPA20	-39	106.82	111.80	33	98	93	34	25	18	DPA20	10	5	3	0.5	0.5	0.5	0.5	0.261	DPA20	2	0.5	91	7	0.5	2.6
DPA21	-37	1796.16	1775.53	24.2	98	91	38	30	25	DPA21	18	12	8	3	0.5	0.5	0.5	0.266	DPA21	2	0.5	85	13	0.5	2.67
DPA22	-39	247.19	269.26	24.5	98	93	42	33	26	DPA22	18	10	8	6	0.5	0.5	0.5	0.276	DPA22	2	0.5	85	13	0.5	2.6
DPA23	-39	165.32	141.42	23.8	98	88	30	21	15	DPA23	7	2	0.5	0.5	0.5	0.5	0.5	0.248	DPA23	2	0.5	94	4	0.5	2.58
DPA24	-40	1942.04	1960.23	28.9	92	88	62	56	49	DPA24	34	16	5	2	0.5	0.5	0.5	0.575	DPA24	8	0.5	71	21	0.5	2.61
DPA37	-39	452.89	474.34	24.9	97	91	31	22	15	DPA37	8	3	0.5	0.5	0.5	0.5	0.5	0.253	DPA37	3	0.5	93	4	0.5	2.57
DPA38	-39	452.89	474.34	26.7	97	89	32	23	17	DPA38	11	6	4	2	0.5	0.5	0.5	0.253	DPA38	3	0.5	89	8	0.5	2.58
DPA39	-38	254.80	250.00	23.2	98	93	32	23	16	DPA39	9	4	2	0.5	0.5	0.5	0.5	0.256	DPA39	2	0.5	93	5	0.5	2.64
DPA40	-38	254.80	250.00	25.5	97	91	32	22	16	DPA40	9	4	2	0.5	0.5	0.5	0.5	0.254	DPA40	3	0.5	91	6	0.5	2.62
DPA41	-38	1543.85	1916.38	30.1	98	94	39	29	21	DPA41	12	5	2	0.5	0.5	0.5	0.5	0.27	DPA41	2	0.5	91	7	0.5	2.6
DPA42	-38	1543.85	1916.38	26.8	97	92	35	25	17	DPA42	9	3	0.5	0.5	0.5	0.5	0.5	0.261	DPA42	3	0.5	92	5	0.5	2.6

SampleID_	MedianPS	Nitrite + Ni	Total Kjeld	Total Nitro	Total Phosp	Total Orgar	Total Carbo	Total Inorganic Carbon
DPA1	0.258	0.1	290	290	310	0.13	4.05	3.92
DPA2	0.264	0.2	150	150	377	0.1	4	3.9
DPA3	0.389	0.2	360	360	417	0.18	6.55	6.37
DPA4	0.235	0.4	190	190	382	0.14	3.73	3.59
DPA5	0.243	0.2	280	280	352	0.16	4.04	3.88
DPA6	0.29	0.05	190	190	434	0.13	4.46	4.33
DPA7	0.258	0.1	240	240	413	0.15	4.59	4.44
DPA8	0.242	0.7	250	250	426	0.14	4.26	4.12
DPA9	0.25	0.5	140	140	281	0.24	4.45	4.21
DPA10	0.259	0.6	290	290	474	0.15	4.58	4.43
DPA11	0.263	0.4	290	290	405	0.24	6.22	5.98
DPA12	0.256	0.4	120	120	290	0.11	4.43	4.32
DPA13	0.263	0.2	200	200	382	0.13	4.76	4.63
DPA14	0.292	0.2	350	350	501	0.08	4.65	4.57
DPA15	0.253	0.4	240	240	404	0.15	4.15	4
DPA16	0.241	0.4	160	160	354	0.1	3.72	3.62
DPA17	0.263	0.3	180	180	295	0.12	4.04	3.92
DPA18	0.293	0.4	150	150	305	0.12	4.42	4.3
DPA19	0.27	0.2	230	230	337	0.11	4.52	4.41
DPA19B	0.26	0.05	320	320	452	0.12	5.16	5.04
DPA20	0.261	0.2	380	380	578	0.15	3.99	3.84
DPA21	0.266	0.6	120	120	269	0.11	3.97	3.86
DPA22	0.276	0.2	130	130	280	0.09	4.9	4.81
DPA23	0.248	0.8	230	230	561	0.13	4.19	4.06
DPA24	0.575	0.3	500	500	522	0.24	6.48	6.24
DPA37	0.253	0.7	200	200	374	0.12	4.67	4.55
DPA38	0.253	0.4	340	340	420	0.12	4.26	4.14
DPA39	0.256	0.4	190	190	326	0.13	4.11	3.98
DPA40	0.254	0.2	220	220	322	0.17	4.39	4.22
DPA41	0.27	0.2	250	250	356	0.18	5.17	4.99
DPA42	0.261	0.4	230	230	304	0.17	4.76	4.59

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum
FLA1	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA1	0.12	NA	NA	NA	NA	NA	NA	NA	FLA1	0.12	NA	NA	NA	NA	NA
FLA2	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA2	0.1	NA	NA	NA	NA	NA	NA	NA	FLA2	0.1	NA	NA	NA	NA	NA
FLA3	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA3	0.08	NA	NA	NA	NA	NA	NA	NA	FLA3	0.08	NA	NA	NA	NA	NA
FLA4	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA4	0.1	NA	NA	NA	NA	NA	NA	NA	FLA4	0.1	NA	NA	NA	NA	NA
FLA5	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA5	0.08	NA	NA	NA	NA	NA	NA	NA	FLA5	0.08	NA	NA	NA	NA	NA
FLA6	NA	2.5	2.5	2	2	2	2	2	2	2	FLA6	NA	2	2	2	2	2	2	2	FLA6	NA	2	2	2	2.5	2
FLA7	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA7	0.12	NA	NA	NA	NA	NA	NA	NA	FLA7	0.12	NA	NA	NA	NA	NA
FLA8	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA8	0.14	NA	NA	NA	NA	NA	NA	NA	FLA8	0.14	NA	NA	NA	NA	NA
FLA9	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA9	0.1	NA	NA	NA	NA	NA	NA	NA	FLA9	0.1	NA	NA	NA	NA	NA
FLA10	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA10	0.08	NA	NA	NA	NA	NA	NA	NA	FLA10	0.08	NA	NA	NA	NA	NA
FLA11	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA11	0.12	NA	NA	NA	NA	NA	NA	NA	FLA11	0.12	NA	NA	NA	NA	NA
FLA12	0.12	2.5	2.5	2	2	2	2	2	2	2	FLA12	0.12	2	2	2	2	2	2	2	FLA12	0.12	2	2	2	2.5	2
FLA13	0.11	NA	2.5	2	2	2	2	2	2	2	FLA13	0.11	2	2	2	2	2	2	2	FLA13	0.11	2	2	2	2.5	2
FLA14	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA14	0.08	NA	NA	NA	NA	NA	NA	NA	FLA14	0.08	NA	NA	NA	NA	NA
FLA15	0.09	2.5	8	2	2	2	2	2	2	2	FLA15	0.09	2	2	2	2	2	2	2	FLA15	0.09	2	2	2	2.5	8
FLA16	0.11	NA	2.5	2	2	2	2	2	2	2	FLA16	0.11	2	2	2	2	2	2	2	FLA16	0.11	2	2	2	2.5	2
FLA17	0.11	NA	2.5	2	2	2	2	2	2	2	FLA17	0.11	2	2	2	2	2	2	2	FLA17	0.11	2	2	2	2.5	2
FLA18	0.12	NA	2.5	2	2	2	2	2	2	2	FLA18	0.12	2	2	2	2	2	2	2	FLA18	0.12	2	2	2	2.5	2
FLA19	0.13	2.5	2.5	2	2	2	2	2	2	2	FLA19	0.13	2	2	2	2	2	2	2	FLA19	0.13	2	2	2	2.5	2
FLA20	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA20	0.08	NA	NA	NA	NA	NA	NA	NA	FLA20	0.08	NA	NA	NA	NA	NA
FLA21	0.09	NA	2.5	2	2	2	2	2	2	2	FLA21	0.09	2	2	2	2	2	2	2	FLA21	0.09	2	2	2	2.5	2
FLA22	0.1	NA	2.5	2	2	2	2	2	2	2	FLA22	0.1	2	2	2	2	2	2	2	FLA22	0.1	2	2	2	2.5	2
FLA23	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA23	0.1	NA	NA	NA	NA	NA	NA	NA	FLA23	0.1	NA	NA	NA	NA	NA
FLA24	0.08	NA	2.5	2	2	2	2	2	2	2	FLA24	0.08	2	2	2	2	2	2	2	FLA24	0.08	2	2	2	2.5	2
FLA25	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA25	0.08	NA	NA	NA	NA	NA	NA	NA	FLA25	0.08	NA	NA	NA	NA	NA
FLA26	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA26	0.08	NA	NA	NA	NA	NA	NA	NA	FLA26	0.08	NA	NA	NA	NA	NA
FLA28	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA28	0.07	NA	NA	NA	NA	NA	NA	NA	FLA28	0.07	NA	NA	NA	NA	NA
FLA37	0.12	2.5	2.5	2	2	2	2	2	2	2	FLA37	0.12	2	2	2	2	2	2	2	FLA37	0.12	2	2	2	2.5	2
FLA38	0.13	2.5	2.5	2	2	2	2	2	2	2	FLA38	0.13	2	2	2	2	2	2	2	FLA38	0.13	2	2	2	2.5	2
FLA39	0.1	NA	2.5	2	2	2	2	2	2	2	FLA39	0.1	2	2	2	2	2	2	2	FLA39	0.1	2	2	2	2.5	2
FLA40	0.1	NA	2.5	2	2	2	2	2	2	2	FLA40	0.1	2	2	2	2	2	2	2	FLA40	0.1	2	2	2	2.5	2
FLA41	0.1	NA	2.5	2	2	2	2	2	2	2	FLA41	0.1	2	2	2	2	2	2	2	FLA41	0.1	2	2	2	2.5	2
FLA42	0.09	NA	2.5	2	2	2	2	2	2	2	FLA42	0.09	2	2	2	2	2	2	2	FLA42	0.09	2	2	2	2.5	2

SampleID_	Total Orga	Naphthale	Methylnap	Acenaphth	Acenaphth	Fluorene	Phenanthr	Anthracen	Fluoranthe	Pyrene	SampleID_	Total Orga	Benzaanth	Chrysene	BenzobjFlu	Benzokfluo	Benzoepyr	Benzoapyr	Perylene	SampleID_	Total Orga	BenzoghiP	DibenzahA	Indeno1.2.	Coronene	PAHsum
FLA1	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA1	0.12	NA	NA	NA	NA	NA	NA	NA	FLA1	0.12	NA	NA	NA	NA	NA
FLA2	0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA2	0.10	NA	NA	NA	NA	NA	NA	NA	FLA2	0.10	NA	NA	NA	NA	NA
FLA3	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA3	0.08	NA	NA	NA	NA	NA	NA	NA	FLA3	0.08	NA	NA	NA	NA	NA
FLA4	0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA4	0.10	NA	NA	NA	NA	NA	NA	NA	FLA4	0.10	NA	NA	NA	NA	NA
FLA5	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA5	0.08	NA	NA	NA	NA	NA	NA	NA	FLA5	0.08	NA	NA	NA	NA	NA
FLA6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA6	NA	NA	NA	NA	NA	NA	NA	NA	FLA6	NA	NA	NA	NA	NA	NA
FLA7	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA7	0.12	NA	NA	NA	NA	NA	NA	NA	FLA7	0.12	NA	NA	NA	NA	NA
FLA8	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA8	0.14	NA	NA	NA	NA	NA	NA	NA	FLA8	0.14	NA	NA	NA	NA	NA
FLA9	0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA9	0.10	NA	NA	NA	NA	NA	NA	NA	FLA9	0.10	NA	NA	NA	NA	NA
FLA10	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA10	0.08	NA	NA	NA	NA	NA	NA	NA	FLA10	0.08	NA	NA	NA	NA	NA
FLA11	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA11	0.12	NA	NA	NA	NA	NA	NA	NA	FLA11	0.12	NA	NA	NA	NA	NA
FLA12	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67	FLA12	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67	FLA12	0.12	16.67	16.67	16.67	20.83	16.67
FLA13	0.11	NA	22.73	18.18	18.18	18.18	18.18	18.18	18.18	18.18	FLA13	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18	FLA13	0.11	18.18	18.18	18.18	22.73	18.18
FLA14	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA14	0.08	NA	NA	NA	NA	NA	NA	NA	FLA14	0.08	NA	NA	NA	NA	NA
FLA15	0.09	27.78	88.89	22.22	22.22	22.22	22.22	22.22	22.22	22.22	FLA15	0.09	22.22	22.22	22.22	22.22	22.22	22.22	22.22	FLA15	0.09	22.22	22.22	22.22	27.78	88.89
FLA16	0.11	NA	22.73	18.18	18.18	18.18	18.18	18.18	18.18	18.18	FLA16	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18	FLA16	0.11	18.18	18.18	18.18	22.73	18.18
FLA17	0.11	NA	22.73	18.18	18.18	18.18	18.18	18.18	18.18	18.18	FLA17	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18	FLA17	0.11	18.18	18.18	18.18	22.73	18.18
FLA18	0.12	NA	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67	FLA18	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67	FLA18	0.12	16.67	16.67	16.67	20.83	16.67
FLA19	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	FLA19	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	FLA19	0.13	15.38	15.38	15.38	19.23	15.38
FLA20	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA20	0.08	NA	NA	NA	NA	NA	NA	NA	FLA20	0.08	NA	NA	NA	NA	NA
FLA21	0.09	NA	27.78	22.22	22.22	22.22	22.22	22.22	22.22	22.22	FLA21	0.09	22.22	22.22	22.22	22.22	22.22	22.22	22.22	FLA21	0.09	22.22	22.22	22.22	27.78	22.22
FLA22	0.10	NA	25.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	FLA22	0.10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	FLA22	0.10	20.00	20.00	20.00	25.00	20.00
FLA23	0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA23	0.10	NA	NA	NA	NA	NA	NA	NA	FLA23	0.10	NA	NA	NA	NA	NA
FLA24	0.08	NA	31.25	25.00	25.00	25.00	25.00	25.00	25.00	25.00	FLA24	0.08	25.00	25.00	25.00	25.00	25.00	25.00	25.00	FLA24	0.08	25.00	25.00	25.00	31.25	25.00
FLA25	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA25	0.08	NA	NA	NA	NA	NA	NA	NA	FLA25	0.08	NA	NA	NA	NA	NA
FLA26	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA26	0.08	NA	NA	NA	NA	NA	NA	NA	FLA26	0.08	NA	NA	NA	NA	NA
FLA28	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	FLA28	0.07	NA	NA	NA	NA	NA	NA	NA	FLA28	0.07	NA	NA	NA	NA	NA
FLA37	0.12	20.83	20.83	16.67	16.67	16.67	16.67	16.67	16.67	16.67	FLA37	0.12	16.67	16.67	16.67	16.67	16.67	16.67	16.67	FLA37	0.12	16.67	16.67	16.67	20.83	16.67
FLA38	0.13	19.23	19.23	15.38	15.38	15.38	15.38	15.38	15.38	15.38	FLA38	0.13	15.38	15.38	15.38	15.38	15.38	15.38	15.38	FLA38	0.13	15.38	15.38	15.38	19.23	15.38
FLA39	0.10	NA	25.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	FLA39	0.10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	FLA39	0.10	20.00	20.00	20.00	25.00	20.00
FLA40	0.10	NA	25.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	FLA40	0.10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	FLA40	0.10	20.00	20.00	20.00	25.00	20.00
FLA41	0.10	NA	25.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	FLA41	0.10	20.00	20.00	20.00	20.00	20.00	20.00	20.00	FLA41	0.10	20.00	20.00	20.00	25.00	20.00
FLA42	0.09	NA	27.78	22.22	22.22	22.22	22.22	22.22	22.22	22.22	FLA42	0.09	22.22	22.22	22.22	22.22	22.22	22.22	22.22	FLA42	0.09	22.22	22.22	22.22	27.78	22.22

SampleID_	Aluminium	Iron	Barium	Antimony	Arsenic	Cadmium	Chromium	Copper	Cobalt	SampleID_	Lead	Manganes	Nickel	Selenium	Silver	Vanadium	Zinc	Mercury	GrossAlph	GrossBeta
FLA1	720	4660	5	0.6	13.6	0.1	11.6	0.5	0.25	FLA1	1.2	46	1.5	0.2	0.05	16.6	2.2	0.005	NA	NA
FLA2	700	4180	5	0.64	12.8	0.05	11.6	0.5	0.25	FLA2	1.2	42	1.4	0.1	0.05	15.8	2.3	0.005	NA	NA
FLA3	720	4360	5	0.25	13.6	0.05	12.7	0.5	0.25	FLA3	1.2	44	1.2	0.1	0.05	14.2	4.3	0.005	250	250
FLA4	660	4450	5	0.25	12.5	0.05	11.4	0.5	0.25	FLA4	1.1	45	1.1	0.2	0.05	14.5	2.3	0.005	NA	NA
FLA5	600	4280	5	0.25	14	0.05	11.3	0.5	0.25	FLA5	1.1	45	1.2	0.1	0.05	16.8	3.7	0.005	NA	NA
FLA6	740	4180	5	0.5	12.7	0.05	11.2	0.5	0.25	FLA6	1.2	44	1.4	0.2	0.05	15.3	12.4	0.005	250	250
FLA7	670	4570	5	0.6	13.4	0.05	10.6	0.5	0.25	FLA7	1.1	47	1.5	0.1	0.05	16	2.6	0.005	NA	NA
FLA8	610	4140	5	0.25	13.6	0.05	11.5	0.5	0.25	FLA8	1.2	48	1.6	0.1	0.1	15.7	2.2	0.005	NA	NA
FLA9	650	4230	10	0.25	13.5	0.05	12	0.5	0.25	FLA9	1.4	52	1.3	0.1	0.05	14.3	7.8	0.005	250	250
FLA10	650	4460	5	0.62	14.5	0.05	13.2	0.5	0.5	FLA10	1.3	48	1.3	0.1	0.05	15.9	3.9	0.005	NA	NA
FLA11	670	4420	5	0.25	13.3	0.05	10.7	0.5	0.25	FLA11	1.2	47	1.2	0.1	0.05	14.4	2.5	0.005	NA	NA
FLA12	630	4260	5	0.65	13.6	0.1	11.3	0.5	0.25	FLA12	1.1	43	1.3	0.05	0.05	15.5	6.9	0.005	250	250
FLA13	690	4760	5	0.53	14.8	0.05	11.3	0.5	0.25	FLA13	1.2	47	1.5	0.1	0.05	16.4	2.5	0.005	NA	NA
FLA14	640	4450	5	0.25	12.5	0.05	10.8	0.5	0.25	FLA14	1	44	0.5	0.1	0.05	15.2	7.1	0.005	600	250
FLA15	640	4260	5	0.25	12.1	0.05	11	0.5	0.25	FLA15	1.8	43	1.4	0.1	0.05	14.9	25.5	0.005	900	250
FLA16	640	4230	5	0.25	14.2	0.05	11	0.5	0.25	FLA16	1.2	48	1.2	0.1	0.05	15.7	2.4	0.005	NA	NA
FLA17	640	4230	5	0.25	12.6	0.05	10.5	0.5	0.25	FLA17	1.2	46	1.6	0.2	0.05	14.6	2.6	0.005	NA	NA
FLA18	620	4100	5	0.54	12.9	0.05	11.4	0.5	0.25	FLA18	1.2	49	1.7	0.1	0.05	15.6	2.5	0.005	NA	NA
FLA19	840	5060	10	0.55	12.2	0.05	14.5	4.5	0.25	FLA19	1.4	45	3	0.1	0.05	14.8	15.8	0.005	250	250
FLA20	630	4220	5	0.54	14.1	0.05	11.6	0.5	0.25	FLA20	1.1	48	1.5	0.1	0.05	16.7	3	0.005	NA	NA
FLA21	600	3840	5	0.25	12.4	0.05	10.8	0.5	0.25	FLA21	1.2	42	1.4	0.1	0.05	14.3	2.7	0.005	NA	NA
FLA22	790	4740	20	0.58	14.4	0.1	13	0.5	0.25	FLA22	1.5	65	1.4	0.1	0.05	15.6	8.6	0.005	250	250
FLA23	610	4030	5	0.66	13.9	0.05	11.5	0.5	0.25	FLA23	1	44	1.5	0.1	0.05	16	2.7	0.005	NA	NA
FLA24	660	4040	5	0.55	14	0.1	12.1	0.5	0.25	FLA24	1.3	46	1.3	0.1	0.05	14.9	5	0.005	1320	250
FLA25	720	4050	5	0.58	12.5	0.05	11.3	0.5	0.25	FLA25	1.3	50	1.2	0.1	0.05	13.1	2.1	0.005	930	250
FLA26	640	4250	5	0.51	13.5	0.05	10.8	0.5	0.25	FLA26	1.1	44	1	0.1	0.05	14.3	4.6	0.005	1690	250
FLA28	600	3770	10	0.25	11.6	0.05	10.3	0.5	0.25	FLA28	1	42	1	0.1	0.05	12.5	4.7	0.005	NA	NA
FLA37	780	5010	5	0.54	14.6	0.05	12.2	0.5	0.25	FLA37	1.2	51	1.7	0.2	0.05	16.9	2.6	0.005	NA	NA
FLA38	710	4540	5	0.59	15	0.05	12.2	0.5	0.25	FLA38	1.3	52	1.7	0.1	0.05	16.9	2.3	0.005	NA	NA
FLA39	650	4570	5	0.25	14	0.05	11.6	0.5	0.25	FLA39	1.1	47	1.4	0.1	0.05	15.4	4.3	0.005	NA	NA
FLA40	530	3520	5	0.25	11.9	0.05	9.4	0.5	0.25	FLA40	1	37	1.2	0.1	0.05	13.5	3.2	0.005	NA	NA
FLA41	590	3990	5	0.56	12.1	0.05	10.3	0.5	0.25	FLA41	0.5	44	1.2	0.1	0.05	13.8	3	0.005	NA	NA
FLA42	640	4750	5	0.25	14.3	0.05	11.7	0.5	0.25	FLA42	1.1	48	1.3	0.05	0.05	15.8	6.2	0.005	NA	NA

SampleID_	depth	WellDist	FacDist	MoistureC	PS75	PS150	PS300	PS425plus	PS600plus	SampleID_	PS1180plu	PS2360plu	PS4750plu	PS9500plu	PS19000pl	PS37500pl	PS75000pl	MedianPS	SampleID_	Clay	Silt	Sand	Gravel	Cobbles	Density
FLA1	-103	457.87	813.94	27.8	99	98	79	55	34	FLA1	8	0.5	0.5	0.5	0.5	0.5	0.5	0.467	FLA1	1	0.5	96	3	0.5	2.63
FLA2	-95.5	1223.92	1923.54	25.8	99	98	78	54	33	FLA2	7	1	0.5	0.5	0.5	0.5	0.5	0.458	FLA2	1	0.5	96	3	0.5	2.68
FLA3	-92.5	144.78	150.00	22.8	97	92	77	68	58	FLA3	39	16	7	2	0.5	0.5	0.5	0.844	FLA3	3	0.5	74	23	0.5	2.62
FLA4	-92.5	470.56	471.70	24.1	99	98	78	53	29	FLA4	7	0.5	0.5	0.5	0.5	0.5	0.5	0.447	FLA4	1	0.5	97	2	0.5	2.68
FLA5	-92.5	248.99	250.00	21.9	99	98	83	59	34	FLA5	7	0.5	0.5	0.5	0.5	0.5	0.5	0.488	FLA5	1	0.5	97	2	0.5	2.64
FLA6	-92.5	110.42	111.80	24.5	NA	NA	NA	NA	NA	FLA6	NA	NA	NA	NA	NA	NA	NA	NA	FLA6	NA	NA	NA	NA	NA	NA
FLA7	-97	275.84	917.88	26.1	99	99	86	66	45	FLA7	12	2	0.5	0.5	0.5	0.5	0.5	0.558	FLA7	1	0.5	94	5	0.5	2.69
FLA8	-88.75	1241.49	1250.00	27.6	98	98	72	49	30	FLA8	7	0.5	0.5	0.5	0.5	0.5	0.5	0.42	FLA8	2	0.5	96	2	0.5	2.66
FLA9	-92.5	85.05	100.00	23.3	99	98	79	54	32	FLA9	7	1	0.5	0.5	0.5	0.5	0.5	0.457	FLA9	1	0.5	96	3	0.5	2.61
FLA10	-92.5	450.34	452.77	22.6	99	98	77	51	27	FLA10	6	0.5	0.5	0.5	0.5	0.5	0.5	0.432	FLA10	1	0.5	97	2	0.5	2.64
FLA11	-88	413.52	427.20	26	99	99	77	51	31	FLA11	8	0.5	0.5	0.5	0.5	0.5	0.5	0.434	FLA11	1	0.5	96	3	0.5	2.65
FLA12	-92.5	100.94	100.00	25.8	99	97	72	50	33	FLA12	15	9	6	4	0.5	0.5	0.5	0.425	FLA12	1	0.5	88	11	0.5	2.63
FLA13	-97.25	472.58	1216.55	26.4	98	97	78	53	29	FLA13	6	0.5	0.5	0.5	0.5	0.5	0.5	0.447	FLA13	2	0.5	96	2	0.5	2.63
FLA14	-92.5	147.93	150.00	23	99	98	80	56	32	FLA14	7	0.5	0.5	0.5	0.5	0.5	0.5	0.469	FLA14	1	0.5	96	3	0.5	2.66
FLA15	-92.5	136.34	141.42	24.1	99	98	76	51	31	FLA15	10	2	0.5	0.5	0.5	0.5	0.5	0.434	FLA15	1	0.5	94	5	0.5	2.66
FLA16	-88	617.00	761.58	23.1	99	98	75	49	26	FLA16	5	0.5	0.5	0.5	0.5	0.5	0.5	0.42	FLA16	1	0.5	97	2	0.5	2.64
FLA17	-92.5	403.05	403.11	27.5	99	98	80	58	37	FLA17	9	1	0.5	0.5	0.5	0.5	0.5	0.492	FLA17	1	0.5	95	4	0.5	2.66
FLA18	-92.5	358.06	400.00	24	99	98	72	46	26	FLA18	6	0.5	0.5	0.5	0.5	0.5	0.5	0.406	FLA18	1	0.5	97	2	0.5	2.65
FLA19	-92.5	44.79	50.00	25.6	99	99	81	57	36	FLA19	10	2	0.5	0.5	0.5	0.5	0.5	0.483	FLA19	1	0.5	95	4	0.5	2.61
FLA20	-92.5	314.62	316.23	23.9	99	99	81	57	35	FLA20	32	8	0.5	0.5	0.5	0.5	0.5	0.481	FLA20	1	0.5	84	15	0.5	2.63
FLA21	-92.5	253.54	269.26	24.2	99	99	71	44	24	FLA21	5	0.5	0.5	0.5	0.5	0.5	0.5	0.397	FLA21	1	0.5	97	2	0.5	2.65
FLA22	-92.5	61.52	70.71	26.5	98	97	77	51	29	FLA22	5	0.5	0.5	0.5	0.5	0.5	0.5	0.433	FLA22	2	0.5	96	2	0.5	2.58
FLA23	-92.5	397.73	403.11	22.8	99	99	78	50	26	FLA23	5	0.5	0.5	0.5	0.5	0.5	0.5	0.425	FLA23	1	0.5	97	2	0.5	2.64
FLA24	-92.5	131.72	141.42	22.8	95	95	75	52	30	FLA24	7	1	0.5	0.5	0.5	0.5	0.5	0.441	FLA24	4	0.5	93	3	0.5	2.62
FLA25	-84.75	265.81	1550.81	26.8	98	98	66	41	22	FLA25	6	0.5	0.5	0.5	0.5	0.5	0.5	0.38	FLA25	2	0.5	96	2	0.5	2.6
FLA26	-92.5	135.04	150.00	21.6	99	98	79	52	29	FLA26	6	1	0.5	0.5	0.5	0.5	0.5	0.447	FLA26	1	0.5	96	3	0.5	2.67
FLA28	-92.5	94.78	100.00	26	99	99	81	54	30	FLA28	8	2	0.5	0.5	0.5	0.5	0.5	0.454	FLA28	1	0.5	95	4	0.5	2.63
FLA37	-97	275.84	917.88	24.3	98	97	75	50	29	FLA37	6	0.5	0.5	0.5	0.5	0.5	0.5	0.425	FLA37	2	0.5	96	2	0.5	2.6
FLA38	-97	275.84	917.88	23.5	99	96	68	45	26	FLA38	6	1	0.5	0.5	0.5	0.5	0.5	0.398	FLA38	1	0.5	96	3	0.5	2.64
FLA39	-92.5	211.42	212.13	23.3	99	98	80	54	28	FLA39	5	0.5	0.5	0.5	0.5	0.5	0.5	0.452	FLA39	1	0.5	97	2	0.5	2.62
FLA40	-92.5	211.42	212.13	24	99	99	80	52	29	FLA40	5	0.5	0.5	0.5	0.5	0.5	0.5	0.44	FLA40	1	0.5	97	2	0.5	2.64
FLA41	-92.5	314.62	316.23	25.7	99	98	84	59	33	FLA41	6	0.5	0.5	0.5	0.5	0.5	0.5	0.486	FLA41	1	0.5	97	2	0.5	2.63
FLA42	-92.5	314.62	316.23	24.2	98	98	85	61	36	FLA42	6	0.5	0.5	0.5	0.5	0.5	0.5	0.502	FLA42	1	0.5	97	2	0.5	2.61

SampleID_	MedianPS	Nitrite + Ni	Total Kjelda	Total Nitro	Total Phos	Total Orga	Total Carbo	Total Inorganic Carbon		
FLA1	0.467	0.2	180	180	446	0.12	8.28	8.16		
FLA2	0.458	0.2	150	150	420	0.1	8.18	8.08		
FLA3	0.844	0.2	80	80	408	0.08	7.74	7.66		
FLA4	0.447	0.05	160	160	411	0.1	7.71	7.61		
FLA5	0.488	0.8	110	110	498	0.08	7.69	7.61		
FLA6	NA	0.2	150	150	380	NA	NA	7.69		
FLA7	0.558	0.1	220	220	465	0.12	8.05	7.93		
FLA8	0.42	0.3	140	140	404	0.14	8.5	8.36		
FLA9	0.457	0.1	100	100	412	0.1	7.57	7.47		
FLA10	0.432	0.1	110	110	478	0.08	7.64	7.56		
FLA11	0.434	0.2	150	150	428	0.12	6.8	6.68		
FLA12	0.425	0.05	120	120	400	0.12	8.14	8.02		
FLA13	0.447	0.3	140	140	472	0.11	8.03	7.92		
FLA14	0.469	0.1	160	160	406	0.08	7.54	7.46		
FLA15	0.434	0.2	90	90	448	0.09	7.56	7.47		
FLA16	0.42	0.1	170	170	390	0.11	7.33	7.22		
FLA17	0.492	0.1	140	140	447	0.11	8.1	7.99		
FLA18	0.406	0.2	140	140	433	0.12	7.9	7.78		
FLA19	0.483	0.2	90	90	352	0.13	7.36	7.23		
FLA20	0.481	0.05	100	100	601	0.08	7.73	7.65		
FLA21	0.397	0.2	120	120	433	0.09	7.62	7.53		
FLA22	0.433	0.3	140	140	445	0.1	7.9	7.8		
FLA23	0.425	0.2	130	130	437	0.1	7.65	7.55		
FLA24	0.441	0.2	70	70	338	0.08	7.49	7.41		
FLA25	0.38	0.2	120	120	422	0.08	7.49	7.41		
FLA26	0.447	0.2	100	100	389	0.08	7.42	7.34		
FLA28	0.454	0.2	110	110	381	0.07	7.62	7.55		
FLA37	0.425	0.1	110	110	402	0.12	8.09	7.97		
FLA38	0.398	0.1	160	160	518	0.13	7.08	6.95		
FLA39	0.452	0.2	110	110	395	0.1	7.92	7.82		
FLA40	0.44	0.1	130	130	344	0.1	7.62	7.52		
FLA41	0.486	0.3	140	140	406	0.1	8.08	7.98		
FLA42	0.502	0.05	110	110	458	0.09	7.73	7.64		

Appendix G Environmental Survey 1 (Summer) infauna – Statistical analysis of infauna species assemblages

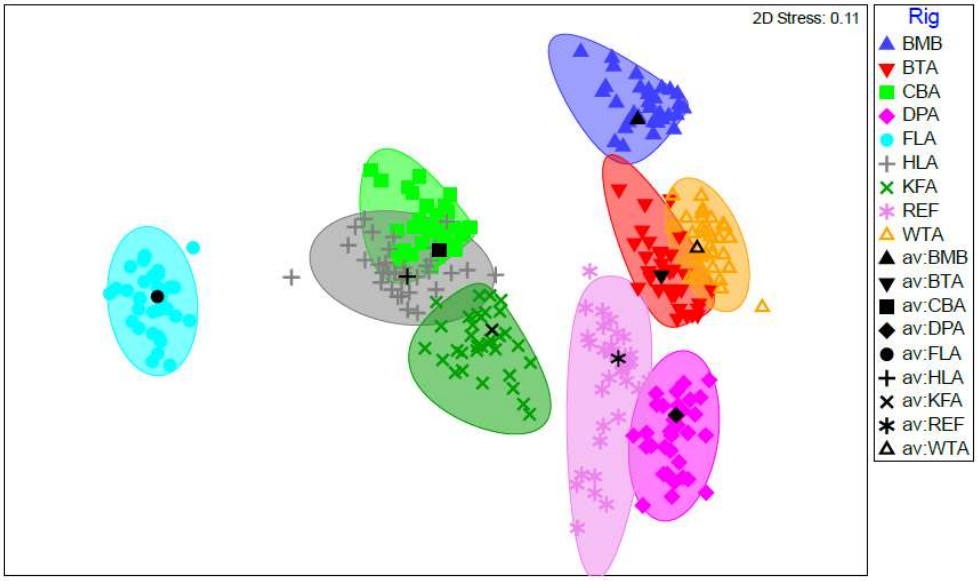


Figure G-1 Ordination plot (metric multidimensional scaling of bootstrapped averages) showing the difference between sites based on assemblages of infauna species (AECOM Australia Pty Ltd, 2021)

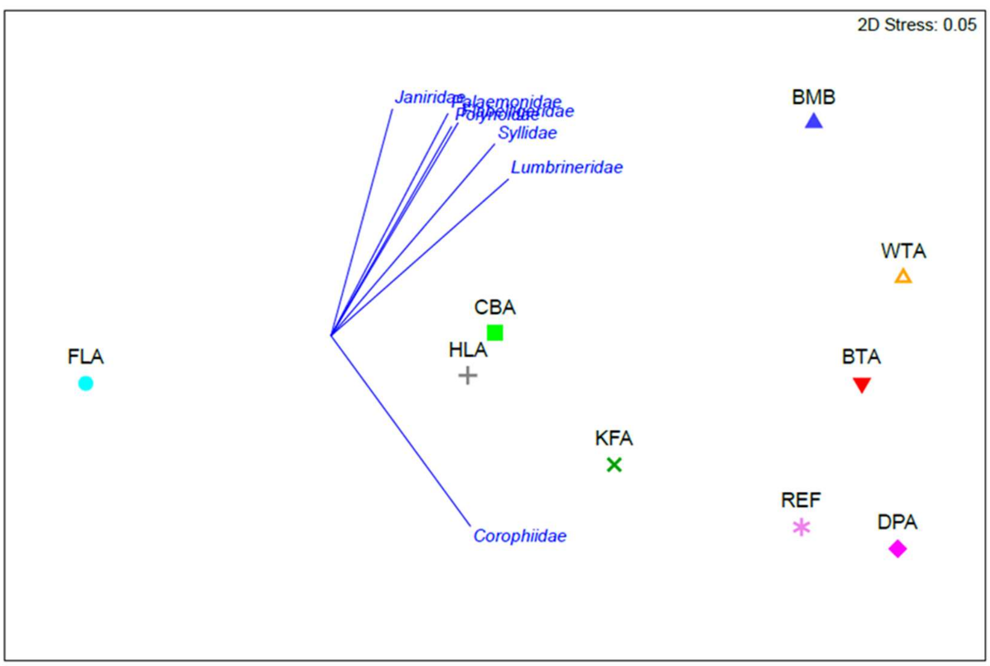


Figure G-2 Ordination plot (non-metric multidimensional scaling) of platform sites based on abundances of infauna, vector overlays represent correlating variables (AECOM Australia Pty Ltd, 2021)

BMB	Amphinomidae Syllidae Corophiidae Dexaminidae Tanaidacea spp								
BTA	Amphinomidae Corophiidae # Tanaidacea spp # Dexaminidae Syllidae **0.262**	Corophiidae Tanaidaceaspp Syllidae Paraonidae Spionidae							
CBA	Amphinomidae Dexaminidae Leptostraca spp Syllidae Corophiidae **0.354**	Corophiidae Tanaidacea spp Onuphidae # Paraonidae Dexaminidae **0.319**	Syllidae Corophiidae Onuphidae Tanaidacea spp Lysianassidae						
DPA	Corophiidae # Amphinomidae Syllidae Leptostraca spp Tanaidacea spp # **0.515**	Corophiidae # Tanaidacea spp Syllidae Amaryllididae # Dexaminidae # **0.191**	Corophiidae # Tanaidacea spp # Onuphidae Amaryllididae # Dexaminidae # **0.428**	Corophiidae Tanaidacea spp Phoxocephalidae Dexaminidae Syllidae					
FLA	Amphinomidae Syllidae Dexaminidae Leptostraca spp Melitidae **0.826**	Corophiidae Tanaidacea spp Paraonidae Syllidae Spionidae **0.779**	Corophiidae Onuphidae Syllidae Tanaidacea spp Lysianassidae # **0.328**	Corophiidae Tanaidacea spp Amaryllididae Ostrocoda spp Syllidae **0.772**	Phoxocephalidae Platyischnopidae Lysianassidae Corophiidae Oedicerotidae				
HLA	Onuphidae # Amphinomidae Syllidae Leptostraca spp Dexaminidae **0.431**	Corophiidae Onuphidae # Tanaidacea spp Paraonidae Syllidae **0.404**	**No sig. dif.**	Corophiidae Onuphidae # Tanaidacea spp Syllida Gyndiastydidae **0.457**	Onuphidae # Tanaidacea spp # Corophiidae # Syllidae # Amphinomidae # **0.342**	Onuphidae Corophiidae Phoxocephalidae Syllidae Ostrocoda spp			
KFA	Corophiidae # Amphinomidae Ostrocoda spp # Onuphidae # Ampheliscidae # **0.448**	Corophiidae # Onuphidae # Tanaidacea spp Ostrocoda spp # Paraonidae # **0.295**	Corophiidae # Onuphidae # Ostrocoda spp # Tanaidacea spp # Ampheliscidae # **0.124**	Corophiidae Onuphidae # Tanaidacea spp # Ostrocoda spp # Ampheliscidae # **0.274**	Corophiidae # Onuphidae # Ostrocoda spp # Tanaidacea spp # Ampheliscidae # **0.47**	Corophiidae # Onuphidae # Tanaidacea spp # Ampheliscidae # Ostrocoda spp # **0.131**	Corophiidae Ostrocoda spp Onuphidae Tanaidacea spp Ampheliscidae		
WTA	Tanaidacea spp # Corophiidae # Amphinomidae Spionidae # Syllidae # **0.216**	**No sig. dif.**	Tanaidacea spp # Corophiidae # Spionidae # Onuphidae Melitidae # **0.422**	Corophiidae # Tanaidacea spp # Spionidae # Melitidae # Syllidae # **0.29**	Tanaidacea spp # Corophiidae # Syllidae # Spionidae # Melitidae # **0.831**	Corophiidae # Tanaidacea spp # Onuphidae Spionidae # Melitidae # **0.476**	Corophiidae Tanaidacea spp # Onuphidae Ostrocoda spp Ampheliscidae **0.339**	Corophiidae Tanaidacea spp Syllidae Spionidae Phoxocephalidae	
REF	Corophiidae# Ampheliscidae# Tanaidacea spp# Amphinomidae Syllidae **0.364**	Corophiidae # Ampheliscidae # Tanaidacea spp # Leptostraca spp # Syllidae **0.189**	Corophiidae # Ampheliscidae # Tanaidacea spp # Phoxocephalidae # Onuphidae **0.307**	Corophiidae # Ampheliscidae # Tanaidacea spp # Leptostraca spp # Sabellidae # **0.16**	Corophiidae # Ampheliscidae # Tanaidacea spp # Phoxocephalidae # Leptostraca spp # **0.739**	Corophiidae # Ampheliscidae # Onuphidae Tanaidacea spp # Leptostraca spp # **0.34**	**No sig. dif.**	Corophiidae # Ampheliscidae # Tanaidacea spp Leptostraca spp # Syllidae **0.254**	Corophiidae Tanaidacea spp Ampheliscidae Hoxocephalidae Ostrocoda spp
	BMB	**BTA**	**CBA**	**DPA**	**FLA**	**HLA**	**KFA**	**WTA**	**REF**

Shaded squares represent typifying species, non-shaded squares represent the distinguishing species, blue squares represent the five most dissimilar pairwise comparisons, green squares represent most similar pairwise comparisons, Analysis of Similarity (ANOSIM) pairwise R-stats are listed in bold typeface, where comparisons were significant. The '#' Indicates greater abundance of corresponding species to site on table left, absence of '#' indicates greater abundance at site along table base. BMB, BTA and DPA facilities not included in scope of this EP.

Figure G-3 Results of pairwise similarity percentage (SIMPER) analysis comparing sites based on relative species abundance (AECOM Australia Pty Ltd, 2021)