Addendum

CDN/ID S4100AH718806

Operational and Scientific Monitoring Plan

Addendum: Otway Development Drilling and Well Abandonment

Review record (record the last 3 revisions here or the revisions required to achieve current approval version)

Revision	Date	Reason for issue	Reviewer/s	Consolidator	Approver
0	14/02/2020	Issued for NOPSEMA assessment	PW	Xodus	PW
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Review due	Review frequency
Annually from date of acceptance	1 year/s

THE THREE WHATS
What can go wrong?
What could cause it to go wrong?
What can I do to prevent it?

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1 Introduction

1.1 Purpose

This Addendum to the Offshore Victoria Operational and Scientific Monitoring Plan (OSMP) (CDN/ID S4100AH717908) provides a description of the:

- worst-case spill scenarios
- matters of national environmental significance (MNES) within the environment that may be affected (EMBA) and predicted oil exposure from stochastic spill modelling
- environmental values and sensitivities of key areas within the EMBA and the operational and scientific monitoring studies that may be relevant to these areas
- priority planning areas for scientific studies
- environmental monitoring implementation plan

associated with the Otway Development Drilling and Well Abandonment Environment Plan (EP) (CDN/ID S4100AH717905).

1.2 Timing

The proposed drilling and well abandonment activities are scheduled to commence during Q1 2021.

1.3 Environment that may be affected

The EMBA has been defined as an area where a change to ambient environmental conditions may potentially occur as a result of planned or unplanned activities. It is noted that a change does not always imply that an adverse impact will occur; for example, a change may be required over a particular exposure value or over a consistent period of time for a subsequent impact to occur. The EMBA defined for the Otway Development Drilling and Well Abandonment EP (CDN/ID S4100AH717905) is shown in Figure 1-1.

1.4 Spill Scenarios

The two credible worst-case spill scenarios for the Artisan-1 Exploration Drilling EP (CDN/ID S4810AH717904) were also adopted for the Otway Development Drilling and Well Abandonment EP (CDN/ID S4100AH717905):

- Subsurface release of 222,224 bbl of gas condensate over 86 days
- Surface release of 300 m^3 of marine diesel oil (MDO) over 6 hours.

A summary of the predicted exposure of MNES within the EMBA is provided in Section 2.1. For a summary of all other stochastic modelling outcomes, refer to descriptions and modelling reports within the EP (CDN/ID S4810AH717904; CDN/ID S4100AH717905). The spatial extent of predicted oil exposure from the stochastic modelling for the subsurface condensate and surface MDO release is shown in Figure 1-2 and Figure 1-3 respectively.

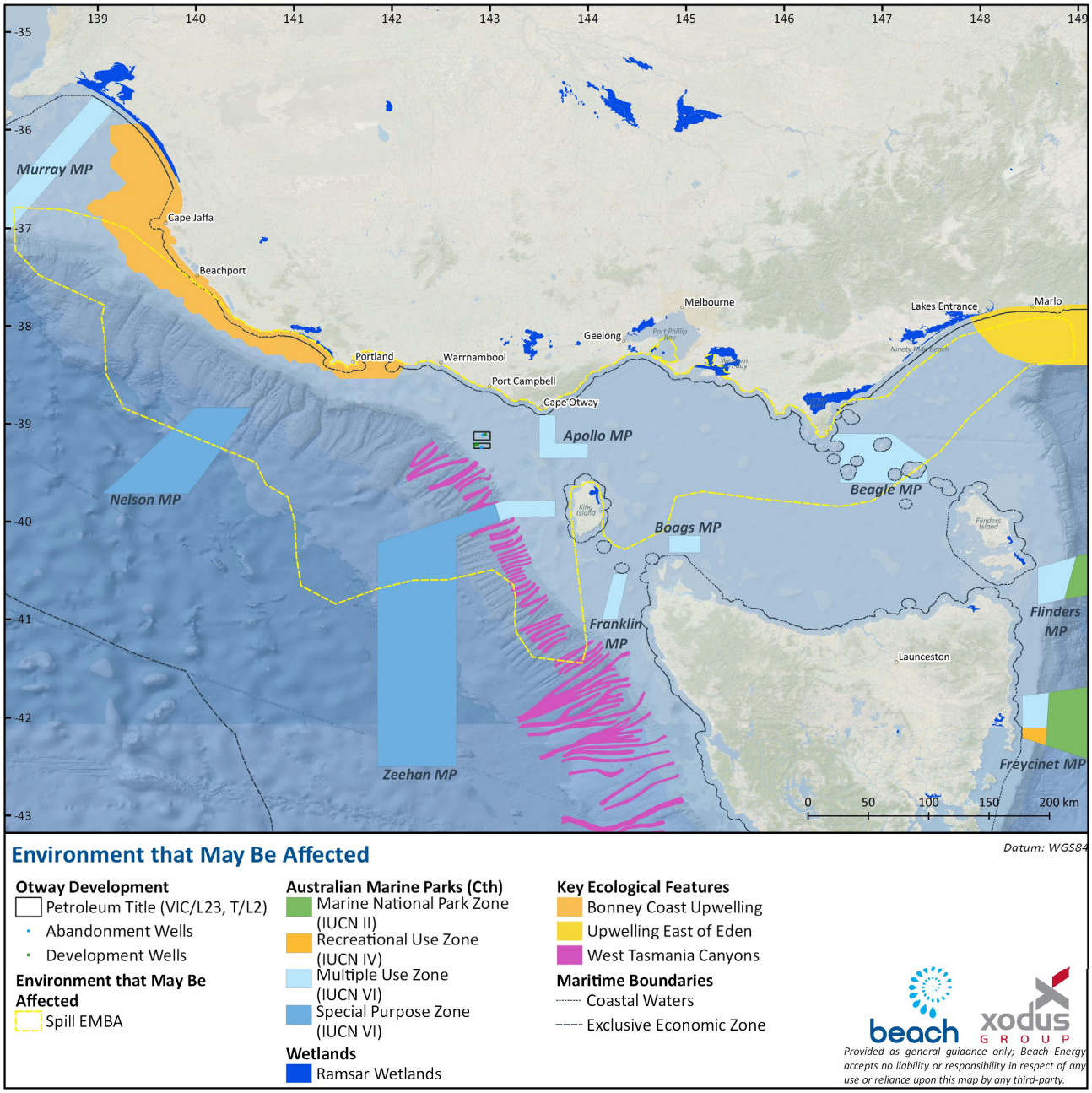

Figure 1-1: Environment that may be affected

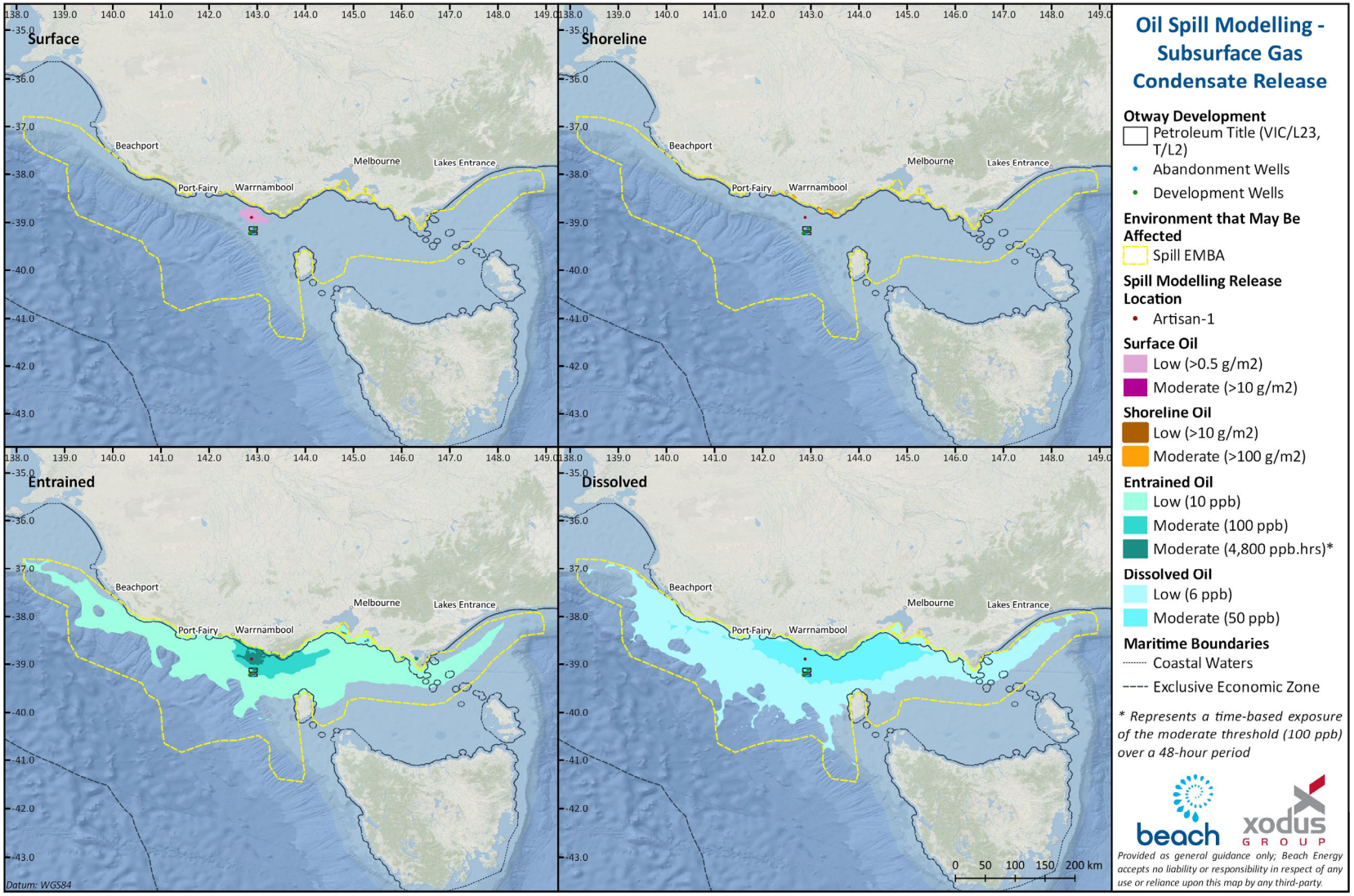

Figure 1-2: Stochastic modelling of predicted oil exposure for a subsurface release of 222,224 bbl of gas condensate from Artisan-1 over 86 days, with the Otway Development EMBA

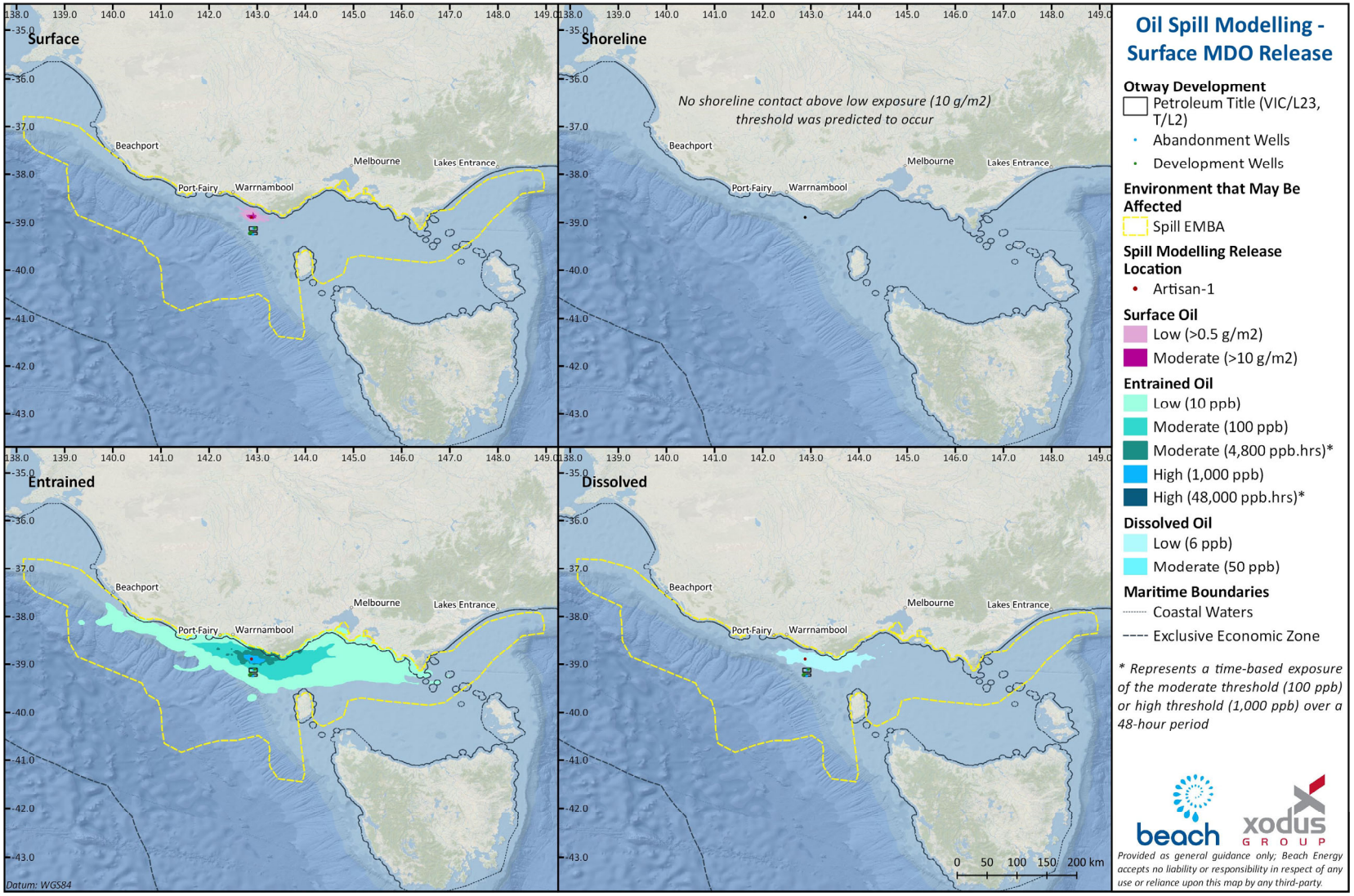

Figure 1-3: Stochastic modelling of predicted oil exposure for a surface release of 300 m^3 of MDO from Artisan-1 over 6 hours, with the Otway Development EMBA

2 Environmental Values and Sensitivities

The information presented in this section is based on spatial extents of stochastic spill modelling (Section 1.4) and/or the EMBA and the MNES and other environmental features identified within the Otway Development Drilling and Well Abandonment EP (CDN/ID S4100AH717905). The information is presented here as context for spill monitoring awareness and planning. It does not restrict the implementation of any monitoring of MNES (or other) features that may be affected by an actual spill event that are beyond the area of predicted oil exposure; i.e. once the relevant initiation criteria are met for an operational and/or scientific study, these can be implemented irrespective of previous modelling outcomes.

2.1 Predicted oil exposure to matters of national environmental significance

Table 2-1 lists MNES that are known to occur within the EMBA and if there is predicted oil exposure at or above low thresholds from either of the worst-case spill scenarios. It is noted that these low thresholds are not always relevant to levels associated with potential impacts, however, may represent a change in ambient environmental conditions.

Table 2-1: Matters of National Environmental Significance within the EMBA

Matters of National Environmental Significance	Marine and/or coastal MNES features/species within the EMBA	Predicted Oil Exposure^ (Surface MDO Release)				Predicted Oil Exposure^ (Subsurface Condensate Release)			
		Shoreline	Surface	Entrained	Dissolved	Shoreline	Surface	Entrained	Dissolved
World Heritage Properties	None present	–	–	–	–	–	–	–	–
National Heritage Places	None present	–	–	–	–	–	–	–	–
Wetlands of International Importance	Corner Inlet	×	×	×	×	×	×	✓	×
	Glenelg Estuary and Discovery Bay wetlands	×	×	×	×	×	×	×	×
	Lavinia	×	×	×	×	×	×	×	×
	Piccaninnie Ponds karst wetlands	×	×	×	×	×	×	×	×
	Port Phillip Bay (western shoreline) and Bellarine Peninsula	×	×	✓	×	×	×	✓	✓
	Western Port	×	×	×	×	×	×	✓	✓
Threatened Ecological Communities	Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	×	×	✓	✓	×	×	✓	✓
	Giant Kelp Marine Forests of South East Australia	×	×	✓	✓	✓	×	✓	✓
	Subtropical and Temperate Coastal Saltmarsh	×	×	✓	×	✓	×	✓	✓
Threatened Species	Various	×	✓	✓	✓	✓	✓	✓	✓
Migratory Species	Various	×	✓	✓	✓	✓	✓	✓	✓
Commonwealth Marine Areas	Apollo Marine Park	×	✓	✓	✓	×	×	✓	✓
	Beagle Marine Park	×	×	✓	×	×	×	✓	✓
	Murray Marine Park	×	×	×	×	×	×	✓	×
	Nelson Marine Park	×	×	×	×	×	×	×	✓

Matters of National Environmental Significance	Marine and/or coastal MNES features/species within the EMBA	Predicted Oil Exposure^ (Surface MDO Release)				Predicted Oil Exposure^ (Subsurface Condensate Release)			
		Shoreline	Surface	Entrained	Dissolved	Shoreline	Surface	Entrained	Dissolved
	Zeehan Marine Park	×	×	×	×	×	×	✓	✓
Great Barrier Reef Marine Park	None present	–	–	–	–	–	–	–	–
Nuclear Actions	None present	–	–	–	–	–	–	–	–
Water Resources	None present	–	–	–	–	–	–	–	–

Notes:

^ Predicted oil exposures are based on results from the stochastic modelling undertaken using a release site of Artisan-1, located approximately 25 km northwest of the Geographe wells.

2.2 Monitoring studies relevant to key areas within the EMBA

Table 2-2 provides a summary of environmental values and sensitivities of identified key areas within the EMBA. Key areas were determined as:

- Australian Marine Parks within the EMBA
- Wetlands of International Importance (Ramsar wetlands) within the EMBA
- Threatened ecological communities within the EMBA
- Threatened or migratory species with a spatially defined biologically important area (BIA) within the EMBA
- Key Ecological Features (KEFs) within the EMBA
- Other protected areas within the EMBA, including State protected marine and terrestrial areas, nationally important wetlands, and heritage features.

The description of values and sensitivities is summarised from the Otway Development Drilling and Well Abandonment EP (CDN/ID S4100AH717905).

Table 2-2: Environmental values and sensitivities of key areas within the EMBA that may be exposed to oil

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Australian Marine Parks			
Apollo Marine Park	• Ecosystems, habitats and communities associated with the Western Bass Strait Shelf Transition and the Bass Strait Shelf Province and associated with the seafloor features: deep/hole/valley and shelf • Important migration area for blue, fin, sei and humpback whales • Important foraging area for black-browed and shy albatross, Australasian gannet, short-tailed shearwater and crested tern • Cultural and heritage site - wreck of the MV City of Rayville	South-east Commonwealth Marine Reserves Network Management Plan 2013-2023	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Beagle Marine Park	• Ecosystems, habitats and communities associated with the Southeast Shelf Transition and associated with the seafloor features: basin, plateau, shelf and sill • Important migration and resting areas for southern right whales • It provides important foraging habitat for the Australian fur seal, killer whale, great white shark, shy albatross, Australasian gannet, short-tailed shearwater, Pacific and silver gulls, crested tern, common diving petrel, fairy prion, black-faced cormorant and little penguin • Cultural and heritage sites including the wreck of the steamship SS Cambridge and the wreck of the ketch Eliza Davies	South-east Commonwealth Marine Reserves Network Management Plan 2013-2023	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Murray Marine Park	• Examples of ecosystems, habitats and communities associated with: the Spencer Gulf Shelf Province, the Southern Province, the West Tasmanian Transition and associated with seafloor features: abyssal plain/deep ocean floor, canyon, escarpment, knoll/abyssal hill, shelf, slope, terrace • Features with high biodiversity and productivity: Bonney coast upwelling, shelf rocky reefs and hard substrate • Important foraging areas for: blue, sei and fin whales, Australian sea lion, wandering, black-browed, yellow-nosed and shy albatrosses, great-winged petrels, flesh-footed and short-tailed shearwaters, and white-faced storm petrel	South-east Commonwealth Marine Reserves Network Management Plan 2013-2023	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S5: Marine fauna impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
	• Important breeding area for the southern right whale and important migration area for the humpback whale		
Nelson Marine Park	• Examples of ecosystems, habitats and communities associated with the West Tasmanian Transition and associated with the seafloor features including the abyssal plain/deep ocean floor, canyon, knoll/abyssal hill, plateau and slope • Important migration area for humpback, blue, fin and sei whales	South-east Commonwealth Marine Reserves Network Management Plan 2013-2023	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S5: Marine fauna impact assessment
Zeehan Marine Park	• Examples of ecosystems, habitats and communities associated with the Tasmania Province, the West Tasmania Transition and the Western Bass Strait Shelf Transition and associated with the seafloor features: abyssal plain/deep ocean floor, canyon, deep/hole/valley, knoll/abyssal hill, shelf and slope • Important migration area for blue and humpback whales • Important foraging habitat for black-browed, wandering and shy albatrosses, and great-winged and cape petrels	South-east Commonwealth Marine Reserves Network Management Plan 2013-2023	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S5: Marine fauna impact assessment
State Marine Protected Areas			
Victoria (Marine National Parks)			
Bunurong Marine National Park	• Extensive intertidal rock platforms and subtidal rocky reefs. • Abundant and diverse marine flora and fauna including over 22 species of marine flora and fauna recorded, or presumed to be, at their eastern or western distributional limits. • Highest diversity of intertidal and shallow subtidal invertebrate fauna recorded in Victoria on sandstone. • Important coastal habitat for several threatened species.	Bunurong Marine National Park Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Churchill Island Marine National Park	• Within the park are numerous marine habitats including mangroves, sheltered intertidal mudflats, seagrass beds, subtidal soft sediments and rocky intertidal shores. • Churchill Island Marine National Park is part of the Western Port Ramsar site. • Churchill Island is an important habitat for many bird species. Migratory waders roost and feed within the Marine National Park including the bar-tailed Godwit and the red-necked stint. • The seagrass beds are major food sources for many commercially viable species such as King George whiting, black bream and yellow-eyed mullet.	N/A (refer to Western Port Ramsar Site Management Plan)	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Discovery Bay Marine National Park	• Recognised roosting, feeding and nesting area for birds such as the hooded plover, and important habitat for the orange-bellied parrot. • Subtidal reefs with giant kelp forest communities. • Deep calcarenite reefs with diverse sponge gardens and shallower reefs with *Ecklonia radiata*. • Diverse array of invertebrates including southern rock lobster, black-lip abalone and gorgonians. The waters also support white sharks and blue whales during the summer breeding season. • Tourism and recreation activities including surfing, boating and dune buggy tours.	Ngootyoong Gunditj Ngootyoong Mara South West Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Point Addis Marine National Park	• This park protects representative samples of subtidal soft sediments, subtidal rocky reef, rhodolith beds and intertidal rocky reef habitats. • The park also provides habitat for a range of invertebrates, fish, algae, birds and wildlife. • The world-famous surfing destination of Bells Beach is within Point Addis Marine National Park.	Point Addis Marine National Park, Point Danger Marine Sanctuary and Eagle Rock Marine Sanctuary Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Port Phillips Head Marine National Park	• The habitats that are found within the park are seagrass beds, sheltered intertidal mudflats, intertidal sandy beaches and rocky shores, subtidal soft substrate and rocky reefs. The bay has a high diversity and abundance of marine flora and fauna that provides a migratory site for wader birds. • Many areas within the Port Phillip Heads Marine National Park are popular for a range of recreational activities.	Port Phillip Heads Marine National Park Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Twelve Apostles Marine Park	• The area is representative of the Otway Bioregion and is characterised by a submarine network of towering canyons, caves, arches and walls with a large variety of seaweed and sponge gardens plus resident schools of reef fish. The park contains areas of calcarenite reef supporting the highest diversity of intertidal and sub-tidal invertebrates found on that rock type in Victoria • The park includes large sandy sub-tidal areas consisting of predominantly fine sand with some medium to coarse sand and shell fragment. Benthic sampling undertaken within the park in soft sediment habitats at 10 m, 20 m and 40 m water depths identified 31, 29 and 32 species respectively based upon a sample area of 0.1 m^2. These species were predominantly polychaetes, crustaceans and nematodes with the mean number of individuals decreasing with water depth. • No visible macroalgae species were present within these soft sediment areas. These sandy expanses support high abundances of smaller animals such as worms, small molluscs and crustaceans; larger animals are less common.	Management Plan for Twelve Apostles Marine National Park and The Arches Marine Sanctuary	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Wilsons Promontory Marine National Park	• Intertidal rocky shores, sandy beaches, seagrass and subtidal soft substrates. • Abundant and diverse marine flora and fauna, including hundreds of fish species and invertebrates such as sponges, ascidians, sea whips and bryozoans. • Important breeding sites for a significant colony of Australian fur seals.	Wilsons Promontory Marine National Park and Wilsons Promontory Marine Park Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
	• Important habitat for several threatened shorebird species, including species listed under international migratory bird agreements. • Seascape, cultural places and objects of high traditional and cultural significance to Indigenous people. • Historic shipwrecks.		S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Victoria (Marine Sanctuaries)			
Barwon Bluff Marine Sanctuary	• Intertidal reef platforms with a high diversity of invertebrate fauna and flora. • Subtidal reefs that support diverse and abundant flora, including kelps, other brown algae, and green and red algae. • Habitats that support resident and migratory shorebirds, fish and marine mammals, including threatened species; and • Tourism and recreational activities. • Cultural heritage, including areas for gathering fish and shellfish for the Wathaurong people. • Historic shipwreck.	Barwon Bluff Marine Sanctuary Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Eagle Rocks Marine Sanctuary	• The main habitats protected by the sanctuary include intertidal and subtidal soft sediment, and intertidal and subtidal reefs.	Point Addis Marine National Park, Point Danger Marine Sanctuary and Eagle Rock Marine Sanctuary Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Marengo Reefs Marine Sanctuary	• Subtidal soft sediments, subtidal rocky reefs and intertidal reefs. high diversity of algal, invertebrate and fish species. • Australian fur-seal haul out area. • Evidence of a long history of Indigenous use.	Marengo Reefs Marine Sanctuary Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
	• Historic shipwrecks. • Tourism and recreational activities including snorkelling and seal watching.		S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Merri Marine Sanctuary	• Merri Marine Sanctuary contains a mixture of habitats, including intertidal reef, sand, shallow reef and rocky overhang. These areas provide a nursery for many fish species and a habitat for many algae species, hardy invertebrates and shorebirds. Bottlenose dolphins and fur seals are regular visitors to the shore. • Culturally significant to indigenous communities that have a long association with the area.	Merri Marine Sanctuary Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Mushroom Reef Marine Sanctuary	• Subtidal pools and boulders in the intertidal area that provide a high complexity of intertidal basalt substrates and a rich variety of microhabitats. • A range of reef habitats that support diverse and abundant flora including kelps, other brown, green and red algae; invertebrates including gorgonian fans, seastars, anemones, ascidians, barnacles and soft corals; and sedentary and migratory fish species. • Sandy bottoms habitats that support large beds of *Amphibolis* seagrass and patches of green algae. • Intertidal habitats that support resident and migratory shorebird species including threatened species. • Culturally important areas for the Boonwurrung people. • Recreational activities including diving and snorkelling.	Mushroom Reef Marine Sanctuary Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Point Danger Marine Sanctuary	• Encompasses and offshore rock platform. The limestone reef is covered in small boulders and intricate seaweed beds, the reef is home to numerous species, including a high diversity of seaslugs, currently 96 species known to occur in this sanctuary, many of which are endemic.	Point Addis Marine National Park, Point Danger Marine Sanctuary and Eagle Rock Marine Sanctuary Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
	• Recreational activities including snorkelling. • Historic shipwreck.		S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
The Arches Marine Sanctuary	• The Arches Marine Sanctuary protects 45 ha of ocean directly south of Port Campbell. It has a spectacular dive site of limestone formations, rocky arches and canyons. • The sanctuary is also ecologically significant, supporting habitats such as kelp forests and a diverse range of sessile invertebrates on the arches and canyons. • These habitats support schools of reef fish, seals and a range of invertebrates such as lobster, abalone and sea urchins.	Management Plan for Twelve Apostles Marine National Park and The Arches Marine Sanctuary	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Tasmania			
Kent Group National Park	• The marine reserve component of the national park covers ~290 km^2 surrounding the islands. • High diversity of fish species. • Unique marine life. • Important refuge for seabirds. • Sanctuary for the Australian fur-seals who utilise the rocky outcrops.	Kent Group National Park (Terrestrial Portion) Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
South Australia			
Lower South East Marine Park	• High diversity of plants and animals due to the influence of the Bonney Upwelling, an ocean current that supplies nutrient-rich water to the area.	Lower South East Marine Park Management Plan	O2: Water quality O3: Sediment quality

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
	• Reef systems, including giant kelp forests. • Import feeding and resting ground for migratory and resident shorebirds. • Foraging area for pygmy blue whale. • Recreational activities including fishing, diving and snorkelling.		O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
State Terrestrial Protected Areas			
Victoria (National Parks)			
French Island National Park	• Mainland or island-based protected areas with a coastal interface that may be used as habitat for marine fauna (birds, pinnipeds etc) • Where access is allowed, recreational activities may be present	French Island National Park Management Plan	O3: Sediment quality O4: Marine fauna surveillance S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Great Otway National Park		Great Otway National Park and Otway Forest Park Management Plan	
Mornington Peninsula National Park		Mornington Peninsula National Park and Arthurs Seat State Park Management Plan	
Port Campbell National Park		Port Campbell National Park Management Plan	
Wilsons Promontory National Park		Wilsons Promontory National Park Management Plan	
Victoria (State, Conservation, Nature, Wildlife Reserves)			
Bay of Islands Conservation Park	• Mainland or island-based protected areas with a coastal interface that may be used as habitat for marine fauna (birds, pinnipeds etc) • Where access is allowed, recreational activities may be present	Port Campbell National Park and Bay of Islands Coastal Park Management	O3: Sediment quality O4: Marine fauna surveillance S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Cape Liptrap Conservation Park		Cape Liptrap Coastal Park Management Plan	
Cape Nelson State Park		N/A	
Discovery Bay Conservation Park		N/A	

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Douglas Point Conservation Park		N/A	
Lady Julia Percy Island Wildlife Reserve		N/A	
Phillip Island Nature Park		N/A	
Piccaninnie Ponds Conservation Park		N/A	
Reef Island and Bass River Mouth Nature Conservation Reserve		N/A	
Seal Island Wildlife Reserve		N/A	
Swan Bay Wildlife Reserve		N/A	
Yambuk Wetlands Natural Conservation Reserve		N/A	
Tasmania			
Cape Wickham Conservation Area	• Island-based protected areas with a coastal interface that may be used as habitat for marine fauna (birds, pinnipeds etc) • Where access is allowed, recreational activities may be present	N/A	O3: Sediment quality O4: Marine fauna surveillance S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Christmas Island Nature Reserve			
Cone Islet Conservation Area			
Councillor Island Nature Reserve			
Curtis Island Nature Reserve			

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Devils Tower Nature Reserve			
Disappointment Bay State Reserve			
East Moncoeur Island Conservation Area			
West Moncoeur Island Nature Reserve			
Hogan Group Conservation Area			
Lavinia State Reserve			
New Year Island Game Reserve			
North East Islet Nature Reserve			
Rodondo Island Nature Reserve			
Sugarloaf Rock Conservation Area			
Internationally Important Wetlands (Ramsar Wetlands)			
Corner Inlet	• Represents the most southerly marine embayment and intertidal system of mainland Australia. • The site includes Corner Inlet and Nooramunga Marine and Coastal Parks, and the Corner Inlet Marine National Park. • The major features of Corner Inlet are its large geographical area, the wetland types present (particularly the extensive subtidal seagrass beds), diversity of aquatic and semi-aquatic habitats and abundant flora and fauna, including significant proportions of the total global population of a number of waterbird species.	Corner Inlet Ramsar Site Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Glenelg Estuary and Discovery Bay wetlands	• The Glenelg Estuary is a large estuarine system consisting of the main channel of the Glenelg River and a side lagoon called the Oxbow. • The Glenelg estuary contains the only remaining relatively undisturbed salt marsh community in western Victoria. • Spits at river mouths such as those at Glenelg River provide valuable breeding sites for the little tern; this area is one of the few sites where little tern breed in Victoria. • The connection between the marine, estuarine and freshwater components is significant for fish migration and reproduction. • The western end of Discovery Bay Coastal Park at the Glenelg Estuary is popular for fishing, boating, walking and other activities.	Glenelg Estuary and Discovery Bay Ramsar Site Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Lavinia	• The site is an important refuge for a collection of regional and nationally threatened species, including the nationally endangered orange-bellied parrot. • Other critical components of the site include: wetland vegetation communities, regional and national rare plant species, regionally rare bird species, Kind Island scrubtit, water and sea birds, migratory birds, striped marsh frog and the green and gold frog • The site is currently used for conservation and recreation, including boating, fishing, camping and off-road driving. There are artefacts of Indigenous Australian occupation.	N/A (Plan is currently being revised)	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Piccaninnie Ponds karst wetlands	• The site represents two rare wetland types; karst and fen peatlands. • The site falls within a national biodiversity hotspot and supports nationally and internationally listed species of significance including the critically endangered orange-bellied parrot. The site is also important spawning grounds for species within the freshwater wetlands as well as nearby marine environments.	Ramsar Management Plan for Piccaninnie Ponds Karst Wetlands	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Port Phillip Bay (western shoreline) and Bellarine Peninsula	• The site consists of a number of component areas that include parts of the shoreline, intertidal zone and adjacent wetlands. • The site provides important connective habitat for migratory bird species, habitat for fauna staging and foraging, is home to indigenous cultural sites, provides use of resources, and a site for commercial and recreational activities and education initiatives.	Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Western Port	• The area consists of large shallow intertidal areas divided by deeper channels with an adjacent narrow strip of coastal land. • Western Port is valued for its terrestrial and marine flora and fauna, cultural heritage, recreational opportunities and science value. • The area has substantial intertidal areas supported by mangroves, saltmarsh, seagrass communities and unvegetated mudflats, which are significant for its shorebird habitat. • There are three marine parks within the Ramsar site (Yaringa, French Island and Churchill Island Marine Nation Parks).	Western Port Ramsar Site Management Plan	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Nationally Important Wetlands			
Anderson Inlet	• Anderson Inlet is one of the largest estuaries on the Victorian coast. • The inlet is of high value for its fauna, including 23 waterbird species. • Popular for recreational fishing, camping, sailing, power-boating and water-skiing.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Glenelg Estuary	• The Glenelg Estuary is a large estuarine system consisting of the main channel of the Glenelg River and a side lagoon called the Oxbow. • Refer to description under Ramsar Wetlands.	N/A	O2: Water quality O3: Sediment quality

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
			O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Lake Connewarre State Wildlife Reserve	• The Lake Connewarre State Wildlife Reserve consists of an extensive estuarine and saltmarsh system drained by the Barwon River. It includes a large permanent freshwater lake, a deep freshwater marsh, several semi-permanent saline wetlands and an estuary. • Lake Connewarre State Game Reserve is the largest area of native vegetation remaining on the Bellarine Peninsula. • The Lake Connewarre State Game Reserve consists of a wide variety of wetland habitats which support a large and diverse waterbird population and contain a significant area of natural vegetation in this part of the South East Coastal Plain.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Long Swamp	• Long Swamp is a freshwater wetland in the coastal zone Discovery Bay barrier system. It is separated from the sea by an extensive dunefield. • High value wetland for its flora and fauna.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Lavinia Nature Reserve	• Lavinia Nature Reserve (King Island, Tasmania) includes the Sea Elephant River Estuary and associated mudflats, areas of coastal swamp, lagoons and areas of drier marsh inland from the coast. • The wetland area supports species and communities which are threatened in both Tasmania and/or globally. • Refer to description under Ramsar Wetlands.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
			S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Lower Aire River Wetlands	• These wetlands consist of three shallow freshwater lakes, brackish to saline marshes and an estuary on the Aire River floodplain. This floodplain occurs at the confluence of the Ford and Calder Rivers with the Aire River. It is surrounded by the Otway Ranges and dune-capped barrier along the ocean shoreline. • The Lower Aire River Wetlands have extensive beds of Common Reed and groves of Woolly Tea-tree which can support large numbers of waterbirds. These wetlands act as a drought refuge for wildlife. • Lake Hordern is considered to be of State significance for its geomorphology.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Lower Merri River Wetlands	• The Lower Merri River Wetlands are of high value for their geomorphology and are a well-preserved example of interdunal wetlands fed by a small drainage system. • High value for its avifauna. • There are large areas of Common Reed (*Phragmites australis*) with Spiky Club-sedge *(Schoenoplectus pungens*), saltmarsh and mudflats.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Mud Islands	• Mud Islands are a group of low, sandy islands located in the southern part of Port Phillip Bay. The islands are narrow and arranged in a roughly circular configuration around a central tidal lagoon. On the southern, western and northern shores, extensive intertidal mudflats and sea-grass meadows are present. • The islands have very high value for fauna since they support large numbers of migratory wading birds and breeding seabirds. • Mud Islands has a high value for its ecological, recreational, scientific, educational and aesthetic features. It has a very high diversity of birds, 114 species, and is an important feeding and roosting site for many	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
	migratory birds. The wetland is an unusual offshore saltmarsh island complex providing breeding habitat for many birds. Mud Islands provides a wilderness experience for visitors.		
Piccainnie Ponds	• The ponds are a unique karst feature of the South East region and are world renowned for cave diving. • The area contains a number of threatened plant, bird and fish species. • Refer to description under Ramsar Wetlands.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Powlett River Mouth	• The Powlett River Mouth provides valuable habitat for the endangered Orange-bellied Parrot. • The Powlett River Mouth area supports saltmarsh vegetation which is the required habitat of the Orange-bellied Parrot.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Princetown Wetlands	• These wetlands consist of swamps of varying salinity on the floodplains of the Gellibrand River and its tributary, the Serpentine (Latrobe) Creek. Wetlands types present are a deep freshwater marsh, semi- permanent saline marshes and a shallow freshwater marsh • The Princetown Wetlands have extensive beds of Common Reed *Phragmites australis* and meadows dominated by Beaded Glasswort which can support large numbers of waterbirds. • A series of relict spits adjacent to the Gellibrand Estuary and a number of levee banks at various sites have State significance for their geomorphology.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Shallow Inlet Marine & Coastal Park	• Shallow Inlet is a large tidal embayment with a single channel to the sea. • Shallow Inlet is of high value for its avifauna and flora.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Swan Bay and Swan Island	• Swan Bay is a shallow marine embayment partly enclosed by spits and barrier islands such as Swan Island. It is generally <2 m in depth, with 700-1,000 ha of mudflats exposed at low tide, and has extensive seagrass beds. The bay is fringed with saltmarsh including some extensive flats and there are some stands of remnant woodland. • The bay is of high value for its avifauna and flora. It is very productive for birds, molluscs and fish. The saltmarsh and intertidal seagrass meadows are regionally significant. The avifauna is particularly diverse, with 190 bird species recorded. • Swan Bay is a high value wetland for its ecological, recreational and educational features. Swan Bay is an unusual shallow embayment with a mixture of seagrass species which is relatively undisturbed and in good ecological condition.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Western Port	• Western Port is a large bay with extensive intertidal flats, mangroves, saltmarsh, seagrass beds, several small islands and two large islands. • Refer to description under Ramsar Wetlands.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Yambuk Wetlands	• Lake Yambuk is an excellent example of an estuary with extensive overbank swamps. • High value for their flora and fauna. • The vegetation consists of extensive reed beds and narrow bands of saltmarsh.	N/A	O2: Water quality O3: Sediment quality O4: Marine fauna surveillance S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment
Threatened Ecological Communities			
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	• This ecological community is the assemblage of native plants, animals and micro-organisms associated with the dynamic salt-wedge estuary systems that occur within the temperate climate, microtidal regime (<2 m), high wave energy coastline of western and central Victoria. The ecological community currently encompasses 25 estuaries in the region defined by the border between South Australia and Victoria and the most southerly point of Wilsons Promontory.	Approved Conservation for the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	O2: Water quality O3: Sediment quality S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment
Giant Kelp Marine Forests of South East Australia	• Giant kelp (*Macrocystis pyrifera*) is a large brown algae that grows on rocky reefs in cold temperate waters off south east Australia. The kelp grows up from the sea floor 8 m below the sea surface and deeper, vertically toward the water surface. It is the foundation species of this TEC in shallow coastal marine ecological communities. The kelp species itself is not protected, rather, it is communities of closed or semi-closed giant kelp canopy at or below the sea surface that are protected • The largest extent of the ecological community is in Tasmanian coastal waters; some patches may also be found in Victoria and South Australia. • Surveys along the Otway Shelf from Warrnambool to Portland did not locate giant kelp at any site. • Surveys of The Arches Marine Sanctuary and Twelve Apostles Marine National Park have not located giant kelp. • The species has been recorded in Discovery Bay National Park forming part of a mixed brown algae community.	Approved Conservation Advice for Giant Kelp Marine Forests of South East Australia	O2: Water quality O3: Sediment quality S1: Water quality impact assessment S2: Sediment quality impact assessment S3: Subtidal habitats impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
	• An assemblage dominated by the species has been recorded from Merri Marine Sanctuary occupying a very small area (0.2 ha) of rocky reef.		
Subtropical and Temperate Coastal Saltmarsh	• The coastal saltmarsh community consists mainly of salt-tolerant vegetation including grasses, herbs, sedges, rushes and shrubs. Succulent herbs, shrubs and grasses generally dominate and vegetation is generally less than 0.5 m in height. • The saltmarsh community is inhabited by a wide range of infaunal and epifaunal invertebrates and low and high tide visitors such as fish, birds and prawns • It is often important nursery habitat for fish and prawn species. Insects are also abundance and an important food source for other fauna. The dominant marine residents are benthic invertebrates, including molluscs and crabs	Conservation Advice for Subtropical and Coastal Saltmarsh	O2: Water quality O3: Sediment quality S1: Water quality impact assessment S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment
Threatened or Migratory Fauna with BIAs			
White Shark	• Vulnerable, migratory • Foraging, distribution and nursery BIAs	Recovery Plan for the White Shark (*Carcharodon carcharias*)	O4: Marine fauna surveillance S5: Marine fauna impact assessment
Southern Right Whale	• Endangered, migratory • Aggregation, migration and distribution BIAs • Presence may occur from May to November	Conservation Management Plan for the Southern Right Whale, 2011-2021	O4: Marine fauna surveillance S5: Marine fauna impact assessment
Pygmy Blue Whale	• Endangered, migratory • Foraging and distribution BIAs • Typically forage in the Otway region between January and April	Conservation Management Plan for the Blue Whale, 2015-2025	O4: Marine fauna surveillance S5: Marine fauna impact assessment
Australian Sea Lion	• Vulnerable • Foraging BIA	Commonwealth Listing Advice on *Neophoca cinerea* (Australian Sea-lion)	O4: Marine fauna surveillance S5: Marine fauna impact assessment
Antipodean Albatross	• Vulnerable, migratory • Foraging BIA	National recovery plan for threatened albatrosses and giant petrels 2011-2016	O4: Marine fauna surveillance S5: Marine fauna impact assessment
Black-browed Albatross	• Vulnerable, migratory • Foraging BIA		

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
Bullers Albatross	• Vulnerable, migratory • Foraging BIA		
Campbell Albatross	• Vulnerable, migratory • Foraging BIA		
Indian Yellow-nosed Albatross	• Vulnerable, migratory • Foraging BIA		
Shy Albatross	• Vulnerable, migratory • Foraging and breeding BIAs		
Wandering Albatross	• Vulnerable, migratory • Foraging BIA		
Short-tailed Shearwater	• Migratory • Foraging and breeding BIAs	N/A	O4: Marine fauna surveillance S5: Marine fauna impact assessment
Wedge-tailed Shearwater	• Migratory • Foraging and breeding BIAs		
Key Ecological Features			
Bonny Coast Upwelling	• An area of high productivity and aggregations of marine life. • The Bonney coast upwelling is a predictable, seasonal upwelling bringing cold nutrient rich water to the sea surface and supporting regionally high productivity and high species diversity. • It is one of 12 widely recognised and well-known areas worldwide where blue whales are known to feed in relatively high numbers.	N/A	• O2: Water quality • O4: Marine fauna surveillance • S1: Water quality impact assessment • S5: Marine fauna impact assessment
Upwelling East of Eden	• An area of high productivity and aggregations of marine life. • Dynamic eddies of the East Australian Current 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.	N/A	• O2: Water quality • O4: Marine fauna surveillance • S1: Water quality impact assessment • S5: Marine fauna impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
	• 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.		
West Tasmanian Canyons	• An area of high productivity and aggregations of marine life. • These canyons can influence currents, act as sinks for rich organic sediments and debris, and can trap waters or create upwellings that result in productivity and biodiversity hotspots. • Sponges are concentrated near the canyon heads, with the greatest diversity between 200-350 m depth. Sponges are associated with abundance of fishes and the canyons support a diversity of sponges comparable to that of seamounts.	N/A	• O2: Water quality • O3: Sediment quality • S1: Water quality impact assessment • S2: Sediment quality impact assessment • S3: Subtidal habitats impact assessment
Shelf Rocky Reefs and Hard Substrates	• An area of high productivity and aggregations of marine life. • Rocky reefs and hard grounds provide attachment sites for macroalgae and sessile invertebrates, increasing the structural diversity of shelf ecosystems. The reefs provide habitat and shelter for fish and are important for aggregations of biodiversity and enhanced productivity.	N/A	• O2: Water quality • O3: Sediment quality • S1: Water quality impact assessment • S2: Sediment quality impact assessment • S3: Subtidal habitats impact assessment
Bass Cascade	• An area of high productivity and aggregations of marine life. • The mixing of water flows at the Bass Cascades can cause 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.	N/A	• O2: Water quality • O4: Marine fauna surveillance • S1: Water quality impact assessment • S5: Marine fauna impact assessment
Heritage Features			
HMAS Cerberus Marine and Coastal Area	• The Sandy Point/HMAS Cerberus area has high geomorphological, botanical and zoological significance. • Sandy Point is one of the largest spit systems on the Victorian coast and one of the State's most dynamic shorelines. • Is within the Western Port Ramsar wetlands site.	N/A	O3: Sediment quality O4: Marine fauna surveillance S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment

Key Area Location / Feature	Summary of Environmental Values and Sensitivities	Relevant Management Plan / Conservation Advice / Recovery Plan	Relevant Operational and Scientific Monitoring Studies
			S7: Heritage and socioeconomic impact assessment
Swan Island and Naval Waters	• Swan Island is the largest emergent sand accumulation feature in Port Phillip Bay. • Sand Island is the most important high tide roosting area in Swan Bay and at high tide regularly supports half of the shorebirds in the Swan Bay - Mud Islands complex. Sand Island maintains a regular breeding population of the fairy tern and provides the main roosting habitat in Swan Bay for the nationally endangered little tern.	N/A	O3: Sediment quality O4: Marine fauna surveillance S2: Sediment quality impact assessment S4: Intertidal and coastal habitats impact assessment S5: Marine fauna impact assessment S7: Heritage and socioeconomic impact assessment

3 Priority Planning for Scientific Monitoring

Priority planning for scientific monitoring has been developed based on two elements: (i) sensitive areas that may be exposed within a short-period of time, and (ii) study scopes that have a short lead time on preparing an initial Sampling and Analysis Plan (SAP) for implementation.

Priority planning areas for potential scientific monitoring have been identified where the following criteria are met:

- Predicted time to exposure is ≤48 hours **or** distance from the Geographe or Thylacine wells are ≤100 km **and**
- Any of the following sensitive environmental receptors are present:
    - Australian Marine Parks
    - State marine protected areas
    - National or internationally important wetlands
    - Mangrove or saltmarsh habitat
    - Known breeding/calving/nesting aggregation areas for protected (threatened or migratory) fauna
    - Known breeding/haul-out areas for pinnipeds
    - Threatened ecological communities **and**
- Time given for preparation of an initial SAP for a particular scientific monitoring study is ≤48 hours.

Note, the time requirement is based upon the shortest time allowed (i.e. 48 hours) for the Monitoring Provider to prepare an initial SAP for a scientific monitoring study (as defined in the Offshore Victoria OSMP [CDN/ID S4100AH717908]). However, for the Artisan-1 spill modelling (refer to Appendix B of the Otway Development Drilling and Well Abandonment EP (CDN/ID S4100AH717905)), minimum time to exposure was only reported for surface and shoreline[1] oil. Therefore, as a conservative estimate, a distance of 100 km from the wells has also been used as a spatial criterion. This distance was based off a relatively high ambient current of approx. 0.6 m/s and assumes no weathering/evaporation of the oil during transit. This distance is used as an analogue for the areas that may be exposed to oil during the initial 48-hour period.

The selection of sensitive environmental receptors is consistent with the receptors used in determining the onshore priority response planning areas within the OPEP, with the addition of marine protected areas (both Commonwealth and State).

The priority planning areas and relevant scientific monitoring scopes identified for spill scenarios that are relevant to the Otway Development Drilling and Well Abandonment EP (CDN/ID S4100AH717905) are detailed in Table 3-1. A series of

[1] Note: Minimum time to shoreline contact was predicted during spill modelling was three days.

checklists have been developed for these priority planning areas to assist in implementing scientific monitoring studies in these areas (Appendix A).

Table 3-1: Priority planning areas and scientific studies for the Otway Development Drilling and Well Abandonment activities

Sensitive Environmental Receptor	Priority Planning Area	Priority Scientific Studies
Australian Marine Parks	Apollo Marine Park	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Zeehan Marine Park	S1: Water quality impact assessment S2: Sediment quality impact assessment
State marine protected areas	Twelve Apostles Marine National Park	S1: Water quality impact assessment S2: Sediment quality impact assessment
	The Arches Marine Sanctuary	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Merri Marine Sanctuary	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Marengo Reefs Marine Sanctuary	S1: Water quality impact assessment S2: Sediment quality impact assessment
Internationally important wetlands	None	
Nationally important wetlands	Princetown Wetlands	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Lower Aire River Wetlands	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Lower Merri River Wetlands	S1: Water quality impact assessment S2: Sediment quality impact assessment
Sheltered tidal flats	None	
Mangrove habitat	None	
Saltmarsh habitat	Princetown Wetlands	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Lower Aire River Wetlands	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Lower Merri River Wetlands	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Merri Marine Sanctuary	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Port Campbell Bay	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Curdies Inlet	S1: Water quality impact assessment S2: Sediment quality impact assessment
Known breeding/calving/nesting aggregation areas for protected fauna	Bridgewater Bay (established aggregation BIA for Southern Right Whale)	None
	Port Campbell Bay (emerging aggregation area for Southern Right Whale)	None

Sensitive Environmental Receptor	Priority Planning Area	Priority Scientific Studies
	Muttonbird Island (breeding BIA for Wedge-tailed Shearwater)	None
Known breeding/haul-out areas for pinnipeds	Lady Julia Percy Island	None
Threatened ecological communities (Coastal Saltmarsh and/or Salt-wedge Assemblages)	Princetown Wetlands	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Lower Aire River Wetlands	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Port Campbell Bay	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Curdies Inlet	S1: Water quality impact assessment S2: Sediment quality impact assessment
Threatened ecological communities (Giant Kelp)	Twelve Apostles Marine National Park	S1: Water quality impact assessment S2: Sediment quality impact assessment
	Merri Marine Sanctuary	S1: Water quality impact assessment S2: Sediment quality impact assessment

4 Implementation Plan

4.1 Activation

In the unlikely event of a Level 2 or Level 3 offshore spill event, operational and scientific monitoring studies will be initiated once the relevant criteria have been met (as defined in the Offshore Victoria OSMP [CDN/ID S4100AH717908]). The EMT Environment Leader (or delegate) will contact the Monitoring Provider Program Manager who will initiate their response.

4.1.1 Immediate response

Once notified, the Monitoring Provider Program Manager will confirm the availability of Study Leads, and specific sampling and analysis plans (SAPs) will be prepared based on the requirements of the individual spill event. Based on initiated studies and SAPs, personnel, equipment and mobilisation will commence.

4.2 Roles and responsibilities

The key roles and responsibilities for implementation of the OSMP are defined in Table 3-1 of the Offshore Victoria OSMP (CDN/ID S4100AH717908).

Key personnel within Beach with OSMP responsibilities during the Otway Development Drilling and Well Abandonment activities are listed in Table 4-1.

The Monitoring Provider and associated personnel will be identified and activated on a case-by-case basis. RPS have confirmed they have a pool of suitably trained and competent personnel to utilise in the event of a Level 2 or Level 3 hydrocarbon spill event and have confirmed their capacity and availability for the duration of the Otway Development Drilling and Well Abandonment program. The key personnel for the monitoring scopes are listed in Table 4-2.

Table 4-1: Key Beach personnel for OSMP implementation

Role	Name	Contact Details
Emergency Management Team (EMT) Leader	As per the on-call EMT Roster (refer to OPEP for details)	
EMT Environment Leader	As per the on-call EMT Roster (refer to OPEP for details)	

Table 4-2: Key Monitoring Provider personnel for OSMP implementation

Role	Name	Contact Details
Program Manager	Jeremy Fitzpatrick	08 9211 1111 jeremy.fitzpatrick@rpsgroup.com.au
Study Lead/s	Jeremy Fitzpatrick	08 9211 1111 jeremy.fitzpatrick@rpsgroup.com.au
	Dr Garnet Hooper	
	Dr Mike Mackie	
	Dr Matthew Fraser	
	Helen Sivertsen	
	Tamara Al-Hashimi	

4.3 Capability, training and competency

Table 4-3 details the capability assessment for the implementation of the OSMP studies. It identifies the minimum number of personnel to manage and implement the OSMP studies and platforms (vessel, aircraft or vehicles) required to perform the studies. The studies have been grouped where appropriate to ensure effective use of resources.

The number of resources identified is based on:

- in the event of a spill the full EMBA will not be impacted as it represents multiple spill simulations (e.g. 200 per spill scenario)
- no shoreline contact is predicted from a surface MDO release
- higher concentrations of hydrocarbon are spatially limited to the vicinity of the release location (i.e. at the moderate exposure threshold of 10 g/m^2 the predicted surface exposure is up to 12 km for MDO and 4 km for condensate, and no exposure is predicted at the high exposure threshold of 25 g/m^2); however it is noted that lower concentrations that require monitoring do extend beyond these distances
- it is unlikely that wildlife would be oiled within the offshore environment, but some oiling of wildlife may occur along the maximum predicted 8 km length of coast exposed to moderate (100 g/m^2) loading thresholds.

RPS have confirmed they have a pool of suitably trained and competent personnel to fulfil the requirements of the OSMP for the duration of the Otway Development Drilling and Well Abandonment program.

4.4 Sampling and Analysis Plans for Scientific Monitoring

Study S1 (water quality) and S2 (sediment quality) have implementation times of 72 hours once the study has been activated (refer to Offshore Victoria OSMP [CDN/ID S4100AH717908]). Due to the short implementation time, draft standard operating procedures (SOP) have been prepared and are attached here as Appendix B.

As the implementation times for the other scientific studies are longer (4–5 days), specific SAPs including SOP will be developed post-event by the Monitoring Provider. These will be based on the details provided in the Offshore Victoria OSMP (CDN/ID S4100AH717908) and made fit for purpose to the nature and scale of the actual spill event.

4.5 Study Logistics

All field logistics in regard to survey timing, scheduling and scope are subject to safe operating conditions in accordance with Beach (and/or their Monitoring Providers) health, environment and safety policies. This includes the requirements for any additional qualifications and training for field personnel (e.g. medicals, BOSIET, HUET, ADAS Level 2, Coxswains etc.)

4.6 Survey Schedule

Survey scheduling (in terms of locations and sampling order) will be at the discretion of the Study Lead taking into account existing and predicted oil distributions, proximity to environmental sensitivities and forecasted weather/sea state conditions.

4.7 Permits

The worst-case spill scenarios may extend through both Commonwealth and Victorian state waters. The permits generally required by the governments are listed in Table 4-4.

Permit applications require details on the samples to be collected (including timing, species, numbers, methods to be used etc.), and can take up to approximately six weeks for approval. However, in the event of an oil spill, this process is likely to expediated and/or given exemptions.

The Monitoring Provider will confirm the need for any permits during the development of an initial SAP once a spill event has occurred.

Table 4-3: OSMP Capability Needs Assessment for the Otway Development Drilling and Well Abandonment activities

Scope Description	Operational / Scientific Study	Study Lead	Field / Office Personnel	Platform
Program Manager	All	One Program Manager: • Bachelor degree in environmental science/engineering (or equivalent) • >20 years' experience in environmental practice • Familiar OSMP and OPEP, as relevant	N/A	N/A
Oil, water and sediment sampling	O1: Oil characterisation and behaviour O2: Water quality O3: Sediment quality (offshore and intertidal) S1: Water quality impact assessment S2: Sediment quality impact assessment	One Study Lead: • Bachelor degree in environmental science/engineering (or equivalent) • >10 years' experience in environmental practice • Familiar OSMP and OPEP, as relevant	Two vessel personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice • Experienced in the relevant sampling and/or recording techniques • Familiar with oil, water and sediment sampling and recording techniques including insitu profiling). One of the vessel personnel: • Familiar with oil visual observations. Two office personnel: • Bachelor degree in environmental science/engineering or equivalent • > 5 years' experience in environmental practice • Experienced in water and sediment quality data analysis	One vessel
Dispersant efficacy	O5: Dispersant efficacy *Note: aerial surveillance requirements are detailed within the Monitor and Evaluate response within the OPEP*	One Study Lead: • Bachelor degree in environmental science/engineering (or equivalent) • >10 years' experience in environmental practice • Familiar OSMP and OPEP, as relevant	Two vessel personnel: • Familiar with vessel-based oil spill monitoring • Familiar with relevant sampling techniques (e.g. sub-surface video surveillance, use of fluorometer, water sample collection) One vessel personnel: • Experience with ROV/UVA scopes • Experience with air quality monitoring	One vessel
Fish tainting, impact and recovery	O6: Fish tainting S6: Fisheries impact assessment	One Study Lead:	One vessel personnel: • Bachelor degree in environmental science/engineering or equivalent	One vessel

Scope Description	Operational / Scientific Study	Study Lead	Field / Office Personnel	Platform
		• Bachelor degree in environmental science/engineering (or equivalent) • >10 years' experience in environmental practice • Familiar OSMP and OPEP, as relevant	• >5 years' experience in environmental practice • Experienced in the relevant sampling and/or recording techniques (biological tissue sampling, sensory analysis) One vessel personnel: • Familiar with oil and water sampling and recording techniques (hydrocarbon sensory assessment, field biological tissue sampling) • Trained and/or experienced olfactory analysts One office personnel: • Bachelor degree in environmental science/engineering or equivalent • > 5 years' experience in environmental practice • Experience in analysis and interpretation of biota data	
Intertidal and subtidal habitat impact and recovery	S3: Subtidal habitats impact assessment S4: Intertidal and coastal habitats impact assessment	One Study Lead: • Bachelor degree in environmental science/engineering (or equivalent) • >10 years' experience in environmental practice • Familiar OSMP and OPEP, as relevant	Four vessel personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice • Commercial dive qualifications • Experienced in the relevant sampling and/or recording techniques One vessel personnel: • Experienced in commercial ROV operations Two mainland personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice • Experienced in the relevant sampling and/or recording techniques Two office personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice • Experienced in identification, analysis and interpretation of benthic habitat data and sediment quality data analysis	One vessel One vehicle
Coastal habitat impact and recovery	O3: Sediment quality (shoreline) S2: Sediment quality (shoreline) impact assessment	One Study Lead: • Bachelor degree in environmental science/engineering (or equivalent)	Four mainland personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice	Two vehicles

Scope Description	Operational / Scientific Study	Study Lead	Field / Office Personnel	Platform
	S4: Intertidal and coastal habitats impact assessment	• >10 years' experience in environmental practice Familiar OSMP and OPEP, as relevant	• Experienced in the relevant sampling and/or recording techniques Two of the mainland personnel: • Familiar with sediment sampling and recording techniques Two office personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice Experienced in identification, analysis and interpretation of benthic habitat data and sediment quality data analysis	
Marine fauna surveillance, impact and recovery	O4: Marine fauna surveillance S5: Marine fauna impact assessment *Note:* *Aerial surveillance requirements are detailed within the Monitor and Evaluate response within the OPEP* *Oiled, injured, and diseased fauna handling to be undertaken by trained personnel resources are detailed in Oiled Wildlife Response within the OPEP*	Two Study Leads (one for seabirds/shorebirds and one for marine megafauna (marine mammals, sharks, reptiles): • Bachelor degree in environmental science/engineering (or equivalent) • >10 years' experience in environmental practice • Familiar OSMP and OPEP, as relevant	Four vessel personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice • Experienced in the relevant sampling and/or recording techniques • Familiar with fauna observation and recording techniques One of the vessel personnel: • Familiar with tissue sampling, storage and preservation One of the vessel personnel: • Experienced with ROV/UVA scopes Four field personnel seabird/shorebird: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice • Experienced in the relevant sampling and/or recording techniques Two office personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice • Experience in identification, analysis and interpretation of biota data Two office personnel: • Experienced with remote sensing scopes	One Vessel Two vehicles
Heritage and socioeconomic	S7: Heritage and socioeconomic impact assessment		Desktop Assessment - One office personnel:	N/A

Scope Description	Operational / Scientific Study	Study Lead	Field / Office Personnel	Platform
		One Study Lead: • Bachelor degree in environmental science/engineering (or equivalent) • >10 years' experience in environmental practice • Familiar OSMP and OPEP, as relevant	• Bachelor degree in environmental or social science or equivalent • >10 years' experience in environmental/social practice • Experienced in interpretation and management of heritage, social and economic data	
			Field Sampling - Four vessel personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice • Commercial dive qualifications • Experienced in the relevant sampling and/or recording techniques One vessel personnel: • Experienced in commercial ROV operations Two mainland personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice • Experienced in the relevant sampling and/or recording techniques One office personnel: • Bachelor degree in environmental or social science or equivalent • >10 years' experience in environmental practice • Experienced in interpretation and management of heritage, social and economic data Two office personnel: • Bachelor degree in environmental science/engineering or equivalent • >5 years' experience in environmental practice	One Vessel Two vehicles

Table 4-4: Permits that may be required for scientific monitoring

Permit	Relevance	Legislation	Government Agency
Commonwealth			
General Permit Application for: • threatened species and ecological communities • migratory species • whales and dolphins • listed marine species	Required for matters for scientific sampling for matters listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)	EPBC Act	Department of the Environment and Energy
Access to Biological Resources in a Commonwealth Area for Non-Commercial Purposes	An applicant must obtain written permission from each Access Provider. The Access Provider must state permission for the applicant to: • enter the Commonwealth area • take samples from the biological resources of the area • remove samples from the area	EPBC Act	Department of the Environment and Energy
Victoria			
Application for a scientific permit to conduct research in areas managed under the *National Parks Act 1975*	Required for any research activity in marine and intertidal parks protected under Victorian legislation	National Parks Act 1975	Department of Environment, Land, Water and Planning
Application for a scientific permit	Required for any research involving fauna subject to the *Wildlife Act 1975*	Wildlife Act 1975	Department of Environment, Land, Water and Planning

Appendix A Scientific Monitoring Priority Planning Area Summaries

A. 1. Apollo Bay Marine Park

Element	Description	
Potential oil exposure	Surface, Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of Marine Park in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of Marine Park in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S3: Subtidal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	South-east Commonwealth Marine Reserves Network Management Plan 2013-2023	Strategy 3 is based on protection of conservation values from detrimental impacts from environmental incidents; includes requirements for reporting and collaboration with government agencies during response Listed outcomes include: • Impacts associated with environmental incidents are identified and managed appropriately. • Systems for timely reporting of and collaboration on responses to environmental incidents are effective
	Approved Conservation Advice for Giant Kelp Marine Forests of South East Australia	Change in water quality (although listed from other sources) is identified as a threat No specific actions for a post-impact change in water quality listed General actions to monitor changes in condition and extent

A. 2. Zeehan Marine Park

Element	Description	
Potential oil exposure	Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of Marine Park in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of Marine Park in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S3: Subtidal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	South-east Commonwealth Marine Reserves Network Management Plan 2013-2023	Strategy 3 is based on protection of conservation values from detrimental impacts from environmental incidents; includes requirements for reporting and collaboration with government agencies during response Listed outcomes include: • Impacts associated with environmental incidents are identified and managed appropriately. • Systems for timely reporting of and collaboration on responses to environmental incidents are effective

A. 3. Twelve Apostles Marine National Park

Element	Description	
Potential oil exposure	Shoreline, Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of Marine Park in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of Marine Park in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from

Element	Description	
		both within and external to the boundaries of the Marine Park If shoreline sampling is required, cross-shore beach profiles from intertidal to above high-water mark Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S3: Subtidal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S4: Intertidal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	Twelve Apostles Marine National Park and the Arches Marine Sanctuary Management Plan	No specific management actions
	Approved Conservation Advice for Giant Kelp Marine Forests of South East Australia	Change in water quality (although listed from other sources) is identified as a threat Priority actions include those around habitat loss, disturbance and modification; including monitoring progress of recovery through mapping, extent and condition assessments

A. 4. The Arches Marine Sanctuary

Element	Description	
Potential oil exposure	Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of Marine Sanctuary in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of Marine Sanctuary in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S3: Subtidal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides

Element	Description	
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	Twelve Apostles Marine National Park and the Arches Marine Sanctuary Management Plan	No specific management actions

A. 5. Merri Marine Sanctuary

Element	Description	
Potential oil exposure	Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of Marine Sanctuary in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of Marine Sanctuary in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S3: Subtidal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S4: Intertidal and coastal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	Merri Marine Sanctuary Management Plan	No specific management actions
	Approved Conservation Advice for Giant Kelp Marine Forests of South East Australia	Change in water quality (although listed from other sources) is identified as a threat No specific actions for a post-impact change in water quality listed General actions to monitor changes in condition and extent

A. 6. Marengo Reefs Marine Sanctuary

Element	Description	
Potential oil exposure	Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP

Element	Description	
		Given location of Marine Sanctuary in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of Marine Sanctuary in relation to the spill source, a linear / grid sampling design is considered appropriate, including samples from both within and external to the boundaries of the Marine Park Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S3: Subtidal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	Marengo Reefs Marine Sanctuary Management Plan	No specific management actions

A. 7. Princetown Wetlands

Element	Description	
Potential oil exposure	Shoreline, Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of wetland in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along a inshore-offshore gradient and including samples from both within and external to the boundaries of the wetland Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of wetland in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along a inshore-offshore gradient and including samples from both within and external to the boundaries of the wetland If shoreline sampling is required, cross-shore beach profiles from intertidal to above high-water mark Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S4: Intertidal and coastal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides

Element	Description	
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	Conservation Advice for Subtropical and Coastal Saltmarsh	Pollution from oil spill events are identified as a threat Actions for this TEC include identifying coastal saltmarsh as important habitat in all oil spill contingency planning and monitor the application of protocols on the management of spills involving saltmarshes
	Approved Conservation for the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Change in water quality (although listed from other sources) is identified as a threat No specific actions for a post-impact change in water quality listed General activities to monitor changes in condition

A. 8. Lower Aire River Wetlands

Element	Description	
Potential oil exposure	Shoreline, Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of wetland in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along an inshore-offshore gradient and including samples from both within and external to the boundaries of the wetland Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of wetland in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along an inshore-offshore gradient and including samples from both within and external to the boundaries of the wetland If shoreline sampling is required, cross-shore beach profiles from intertidal to above high-water mark Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S4: Intertidal and coastal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides

Element	Description	
Management Plans	Conservation Advice for Subtropical and Coastal Saltmarsh	Pollution from oil spill events are identified as a threat Actions for this TEC include identifying coastal saltmarsh as important habitat in all oil spill contingency planning and monitor the application of protocols on the management of spills involving saltmarshes
	Approved Conservation for the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Change in water quality (although listed from other sources) is identified as a threat No specific actions for a post-impact change in water quality listed General activities to monitor changes in condition

A. 9. Lower Merri River Wetlands

Element	Description	
Potential oil exposure	Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of wetland in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along an inshore-offshore gradient and including samples from both within and external to the boundaries of the wetland Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of wetland in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along an inshore-offshore gradient and including samples from both within and external to the boundaries of the wetland If shoreline sampling is required, cross-shore beach profiles from intertidal to above high-water mark Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S4: Intertidal and coastal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	N/A	

A. 10. Campbell Bay

Element	Description	
Potential oil exposure	Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of bay in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along a inshore-offshore gradient and including samples from both within and external to the boundaries of the bay Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of bay in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along an inshore-offshore gradient and including samples from both within and external to the boundaries of the bay If shoreline sampling is required, cross-shore profiles from intertidal to above high-water mark Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S4: Intertidal and coastal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	Conservation Advice for Subtropical and Coastal Saltmarsh	Pollution from oil spill events are identified as a threat Actions for this TEC include identifying coastal saltmarsh as important habitat in all oil spill contingency planning and monitor the application of protocols on the management of spills involving saltmarshes
	Approved Conservation for the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Change in water quality (although listed from other sources) is identified as a threat No specific actions for a post-impact change in water quality listed General activities to monitor changes in condition

A. 11. Curdies Inlet

Element	Description	
Potential oil exposure	Entrained, Dissolved	
Priority scientific studies	S1: Water quality impact assessment	Refer to Appendix B for SOP Given location of inlet in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along a inshore-

Element	Description	
		offshore gradient and including samples from both within and external to the boundaries of the bay Sample design to be confirmed by Monitoring Provider prior to implementation
	S2: Sediment quality impact assessment	Refer to Appendix B for SOP Given location of inlet in relation to the spill source, a linear sampling design is considered appropriate, with samples taken along an inshore-offshore gradient and including samples from both within and external to the boundaries of the inlet If shoreline sampling is required, cross-shore profiles from intertidal to above high-water mark Sample design to be confirmed by Monitoring Provider prior to implementation
Other scientific studies that may be implemented at the site	S4: Intertidal and coastal habitats impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S5: Marine fauna impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
	S7: Heritage and socioeconomic impact assessment	SOP to be developed post-spill; refer to Offshore Victoria OSMP for relevant guides
Management Plans	Conservation Advice for Subtropical and Coastal Saltmarsh	Pollution from oil spill events are identified as a threat Actions for this TEC include identifying coastal saltmarsh as important habitat in all oil spill contingency planning and monitor the application of protocols on the management of spills involving saltmarshes
	Approved Conservation for the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Change in water quality (although listed from other sources) is identified as a threat No specific actions for a post-impact change in water quality listed General activities to monitor changes in condition

Appendix B Standard Operating Procedures for Water and Sediment Sampling

The Monitoring Provider will review and confirm / update these SOP to ensure they are fit for purpose for the nature and scale of the spill event prior to the SAP being finalised and sampling commencing.

B. 1. Water Sampling – Surface Waters

The number of water samples will be determined on an ad hoc basis, depending on the nature of the spill, the distribution of the spill in relation to sensitive receivers, the availability of resources on site (i.e. vessel availability) and coordination with others responding to the spill (e.g. Australian Maritime Safety Authority).

Triplicate seawater samples will be collected from impact and control sites. Surface water samples will be collected using a marine grade stainless steel bucket from an available support vessel. Subsurface water samples will be collected using Niskin bottles deployed to the appropriate sample depth. The appropriate sample depth should be determined on site in consultation with other agencies, with regard to the modelled distribution of entrained hydrocarbons and a consideration of potential sensitive receivers. Samples will be collected at a range of depths. As a minimum, samples will be collected from 0.5 m below the surface, 0.5 m above the seabed, and in mid water.

Surface water sampling should be conducted as per the following instructions:

1. Prior to deployment, liaise with the vessel crew to ensure that all personnel are familiar with the planned operation.
2. After reviewing the Decon 90 Material Safety Data Sheet (MSDS), clean the sampling bucket using Decon 90, ensuring you are wearing appropriate PPE, including:
    a. high visibility clothing
    b. safety boots
    c. Personal Floatation Device (PFD) if working on the deck
    d. hard hat (if working on the deck)
    e. safety glasses
    f. nitrile gloves.
3. Rinse the sample bucket thoroughly with deionised water once cleaned with Decon 90.
4. Confirm with the deck supervisor and vessel master that the vessel is on station and is prepared for sampling to proceed.
5. Ensure the sampling location is free of potential sources of contamination, including:
    a. grease and oils
    b. overhead wires
    c. exhaust fumes (e.g. incinerators, engine exhaust, cigarette smoke, etc.)
    d. vessel discharges (e.g. ballast water, grey water, sullage, etc.)
6. Ensure the sampling location is free of entanglement risks (e.g. propellers, thrusters, etc.).
7. Ensure the sampling location is safe (guard rails in place, life ring available), and that weather conditions are suitable for sampling.
8. Prepare the sample containers by labelling them appropriately and completing any required field documentation.
9. Ensure one end of the rope is securely attached to the sampling bucket and the other end to the vessel.
10. Lower the bucket into the water, let the bucket fill and haul it back on board.
11. Once the sample is on board, put on a clean pair of nitrile gloves and collect the water samples using the laboratory sample containers provided. Attempt to collect primarily water in the larger bottles and primarily oil in the smaller bottle. Do not sample rinse the bottles and cap them immediately upon collecting the sample.
12. Once collected, ensure that samples are clearly labelled and stored in the refrigerator.
13. Clean the sampling bucket using Decon 90 (see item 2 above for details) and rinse with deionised water.

B. 2. Water Sampling – Subsurface Waters

Subsurface water sampling will be conducted using Niskin bottles, deployed at appropriate depths. The three 10 L Niskin bottles have Teflon coating and external springs making them suitable for trace and heavy metals and hydrocarbons. The number of Niskin bottles casts and the amount of bulk water needed will depend on the sampling design. Ensure all staff review and sign the water quality sampling JHA.

Niskin samples will be collected in accordance with the following procedure:

1. Prior to deployment, liaise with the vessel crew to ensure that all personnel are familiar with the planned operation.
2. After reviewing the Decon 90 Material Safety Data Sheet (MSDS), clean the Niskin bottles using Decon 90, ensuring you are wearing appropriate PPE, including:
    a. high visibility clothing
    b. safety boots
    c. Personal Floatation Device (PFD) if working on the deck
    d. hard hat (if working on the deck)
    e. safety glasses
    f. nitrile gloves
3. Rinse the Niskin bottles thoroughly with deionised water once cleaned with Decon 90. If possible, fill the Niskin bottles with uncontaminated seawater and allow then to sit prior to sampling.
4. Confirm with the deck supervisor and vessel master that the vessel is on station and is prepared for sampling to proceed.
5. Ensure the sampling location is free of potential sources of contamination, including:
    a. grease and oils
    b. overhead wires
    c. exhaust fumes (e.g. incinerators, engine exhaust, cigarette smoke etc.)
    d. vessel discharges (e.g. ballast water, grey water, sullage, etc.).
6. Ensure the sampling location is free of entanglement risks (e.g. propellers, thrusters, etc.).
7. Ensure the sampling location is safe (guard rails in place, life ring available), and that weather conditions are suitable for sampling.
8. Ensure one end of the rope is securely attached to the sampling bucket and the other end to the vessel.
9. Ensure the winch line is clean, smooth and has no broken wires or other things that could obstruct the messenger going down the line.
10. Attach the clump weight to the end of the winch line, approx. 10 – 20 kg (consider current at site).
11. Attach the bottom or deepest bottle 1.5–3 m above the weight.
12. Ensure top air bleed is closed, nozzle is pulled out and the bottle is open or set to sample.
13. Before firing the bottles at depth, allow the bottles to flush with sea water for 1–2 minutes at the sample depth.
14. Send the messenger down the line with enough force that it is going to travel directly down the line.
15. You can keep your hand on the line to feel each bottle close. You should be able to feel a tug on the line as the bottle fires.
16. Raise winch line slowly to retrieve bottles.
17. Take care when removing bottles from the winch line as they will be heavy and care should be taken not too accidently open the bottles.
18. Decant sea water from the Niskin bottle directly into sample containers.
19. When using carboys, carboys should be rinsed three times with a small amount of the sample water prior to filing with the sample.
20. Prepare the sample containers by labelling them appropriately and completing any required field documentation.
21. Lower the bucket into the water, let the bucket fill and haul it back onboard.

22. Once the sample is onboard, put on a clean pair of nitrile gloves and collect the water samples using the laboratory sample containers provided. Attempt to collect primarily water in the larger bottles and primarily oil in the smaller bottle. Do not sample rinse the bottles and cap them immediately upon collecting the sample.
23. Once collected, ensure samples are clearly labelled and stored in a refrigerator.
24. Clean the sampling bucket using Decon 90 (see item 2 above for details) and rinse with deionised water.

B. 3. Sediment Sampling

Sediment samples will be collected using a van Veen sediment grab (or similar sediment sampling device). Prior to taking a grab sample clean the grab using detergent and a scrubbing brush. Be sure to remove any material adhering to the grab. Ensure all staff review and sign the grab sampling JHA. Sediment samples will be collected in accordance with the following procedure:

Note that the vessel crew will operate the grab with assistance from RPS staff and the winch will be operated by vessel crew. Prior to taking a grab sample clean the grab using detergent and a scrubbing brush. Be sure to remove any material adhering to the grab.

1. Prior to deployment, liaise with the vessel crew to ensure that all personnel are familiar with the planned operation and that clear lines of communication are available.
2. Prepare the grab on the deck, making sure it is securely attached to the vessel winch cable. Mouse any shackles to ensure pin does not come undone under load. Be VERY careful around the grab - always keep clear of the grab jaws. Assume that they may trigger at any time.
3. Take care when the grab is off the deck. NEVER stand under the grab. Check all shackles, etc. before lifting grab off deck. Use strops if required to stabilise the grab.
4. Lower the grab to the seabed, it will trigger when the cable goes slack.
5. Bring the grab to the surface and ensure the sample is sufficient. If the grab begins to swing, lower the grab into the sea to dampen the motion.
6. Open the jaws of the grab slightly to allow emptying of surplus water from the sediment sample but try not to let the fine sediments wash away.
7. Once drained of all free water, open grab completely and empty contents onto a tarpaulin on the deck. Note: due to the mechanics of the grab when opening, surface sediments may be concentrated towards the middle of the sample.
8. Collect a sample of the surface sediments by scraping the 250 ml sample jars through the sediments. Be mindful of contamination sources and ensure that all staff handling samples are wearing clean nitrile gloves.
9. Securely stow the grab onboard when not in use.

B. 4. Cleaning and Care

Niskin bottles should be cleaned with Decon 90 before the sampling trip. Once in the field the bottles should be soaked in sea water. This can be done by attaching the Niskin bottles to the winch line and lowering off the vessel. If time permits, allow the bottles to soak for at least one hour. Avoid touching the internal parts of the Niskin bottle or sampling bucket. Ideally Niskin bottles should be stored upright in racks on the vessel. Take care to store equipment away from potential sources of contamination.

B. 5. Chain of Custody

All samples submitted for analysis will be accompanied by a Chain of Custody (CoC) form. The CoC form will accompany samples during transport and delivery. The form will be signed with the time and date recorded by each individual responsible for the samples including RPS staff and laboratory personnel. Upon each exchange, the CoC form is countersigned and duplicated by the relinquisher. The recipient retains the original. When samples are received by the laboratory, a duplicate of the original will be issued to RPS confirming arrival. The CoC allows RPS to track the samples and ensure that samples arrive at the intended destinations on schedule.

B. 6. Sample Transport and Storage

Water and sediment samples should be transported as soon as practicable to a nominated laboratory (refer to the OSMP Implementation Plan) in appropriate containers (eskies) with ice bricks. The holding times for all samples are 7 days. Samples must be provided to the analytical laboratory within this time period. Liaise with RPS staff regarding sample transport, etc., as outlined in the personnel section of the OSMP Implementation Plan.

The proposed analyses to be undertaken by the primary analytical laboratory are total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH) for both sediments and water.