# Volume 3 – Marine environment

Chapter 1 Introduction

* 1. Marine project overview 1-1
	2. Stakeholder engagement 1-4
		1. Engagement activities 1-4
		2. Engagement outcomes and responses 1-5
	3. Structure of the EIS/EES 1-6

[Chapter 2 Marine ecology](#_TOC_250000)

* 1. Method 2-2
		1. Study area 2-4
		2. Legislative context 2-7
		3. Assumptions and limitations 2-10
	2. Existing physical environment 2-10
		1. Currents and waves 2-11
		2. Bathymetry 2-11
		3. Seabed sediments and zones 2-13
		4. Coastal processes 2-13
		5. Water quality 2-13
		6. Underwater noise 2-14
		7. Magnetic fields 2-15
		8. Electric fields 2-15
	3. Existing biological environment 2-17
		1. Benthic environment 2-17
		2. Marine protected areas 2-21
		3. Biologically important areas 2-21
		4. Cetaceans 2-23
		5. Pinnipeds 2-28
		6. Sea turtles 2-29
		7. Marine birds 2-31
		8. Marine fishes 2-40
		9. Marine invertebrates 2-42
		10. Summary of PMST results 2-44
		11. Pelagic environment 2-45
		12. Invasive marine species 2-45
		13. Summary of values 2-47
	4. Construction impacts 2-47
		1. Shore crossing 2-48
		2. Pre-lay grapnel run and cable placement on seabed 2-49
		3. Cable trenching and burial 2-50
		4. Cable infrastructure and hard substrate crossings 2-54
		5. Underwater noise 2-55
		6. Artificial lighting 2-65
		7. Invasive marine species 2-66
		8. Marine fauna collision 2-67
	5. Operation impacts 2-69
		1. Magnetic fields 2-69
		2. Electric fields 2-73
		3. Thermal fields 2-74
		4. Inspection and maintenance impacts 2-75
	6. Environmental performance requirements 2-77
	7. Residual impacts 2-81
		1. Construction 2-81
		2. Operation 2-82
	8. Decommissioning 2-89
	9. Cumulative impacts 2-90
		1. Cumulative impacts during construction 2-91
		2. Cumulative impacts during operation 2-92
	10. Conclusion 2-94

## Chapter 3 Marine resource use

* 1. Method 3-2
		1. Study area 3-3
		2. Legislative context 3-5
		3. Assumptions and limitations 3-6
	2. Existing conditions 3-6
		1. Maritime traffic 3-7
		2. Commercial fisheries 3-9
		3. Recreational fishing 3-10
		4. Recreational boating and other uses 3-10
		5. Existing subsea infrastructure and offshore industries 3-11
		6. Summary of values 3-14
	3. Construction impacts 3-14
		1. Temporary exclusion zones and shore crossing 3-14
		2. Maritime traffic 3-15
		3. Commercial fisheries 3-15
		4. Recreational fishing and boating 3-16
		5. Marine tourism and recreation 3-17
		6. Existing infrastructure 3-18
	4. Operation impacts 3-18
		1. Navigation 3-18
	5. Decommissioning impacts 3-19
	6. Environmental performance requirements 3-20
	7. Residual impacts 3-22
		1. Construction 3-22
		2. Operation 3-22
	8. Cumulative impacts 3-24
	9. Conclusion 3-24

## Chapter 4 Underwater cultural heritage

* 1. Method 4-2
		1. Study area 4-3
		2. Key legislation 4-5
		3. Submerged heritage predictive modelling 4-5
		4. Underwater heritage impact assessment method 4-6
		5. Assumptions and limitations 4-7
	2. Maritime heritage existing environment 4-8
		1. Historical activities and context 4-8
		2. Shipwrecks 4-9
		3. Dumping sites 4-13
		4. Vessel discard 4-13
		5. Unverified geophysical anomalies 4-13
	3. Aboriginal heritage existing environment 4-18
		1. Geological history and human occupation context 4-18
		2. Submerged cultural landscapes 4-20
	4. Summary of cultural heritage values and sensitivities 4-28
		1. Cultural heritage significance 4-29
		2. Cultural heritage sensitivity 4-30
	5. Construction impacts 4-30
		1. Pre-lay grapnel run 4-31
		2. Cable trenching 4-35
		3. Rock armour and concrete mattresses 4-36
		4. Anchoring 4-38
		5. Horizontal directional drilling 4-42
	6. Operation impacts 4-43
	7. Decommissioning impacts 4-46
	8. Environmental performance requirements 4-46
	9. Residual impacts 4-48
	10. Cumulative impacts 4-50
	11. Conclusion 4-51

## Chapter 5 Summary of environmental effects in the marine environment

* 1. Project activities 5-1
	2. Method 5-2
	3. Existing environment 5-2
	4. Effects of construction 5-4
	5. Effects of operation 5-6
	6. Effects of decommissioning 5-7
	7. Conclusion 5-7

# Figures

## Chapter 1 Introduction

Figure 3-01 Marinus Link project overview 1-2

Figure 3-02 Marine survey areas 1-3

Figure 3-03 Consultation phases 1-4

Figure 3-04 Structure of the Marinus Link EIS/EES 1-7

## Chapter 2 Marine ecology

Figure 3-05 Marine ecology study area 2-5

Figure 3-06 PMST search areas 2-6

Figure 3-07 Water depths along the project alignment in Bass Strait 2-11

Figure 3-08 Bathymetry in nearshore Victoria 2-12

Figure 3-09 Magnetic anomalies in Bass Strait 2-16

Figure 3-10 Benthic habitats in central Bass Strait 2-19

Figure 3-11 Benthic habitat images in nearshore Waratah Bay 2-20

Figure 3-12 Conservation areas near the project alignment 2-22

Figure 3-13 Schematic of Helix T-1200 jet trencher burying a cable bundle 2-51

Figure 3-14 Distance to auditory thresholds 2-59

Figure 3-15 PTS and TTS zones for cetacean and pinnipeds 2-60

Figure 3-16 Cross section of magnetic field around buried western subsea cable operating at 750 MW 2-70

Figure 3-17 Existing and future third-party infrastructure near the project area 2-93

## Chapter 3 Marine resource use

Figure 3-18 Marine resource use study area 3-4

Figure 3-19 Annual cumulative marine traffic density in Bass Strait 3-8

Figure 3-20 Key locations of recreational fishing, boating and other uses 3-12

Figure 3-21Existing subsea infrastructure and offshore industries 3-13

## Chapter 4 Underwater cultural heritage

Figure 3-22 Offshore and Victorian nearshore sections of the study area for underwater cultural

heritage 4-4

Figure 3-23 Potential shipwreck and sea dump locations within the offshore section of the study

area 4-10

Figure 3-24 Potential shipwreck and sea dump locations within the Victorian nearshore section

of the study area 4-11

Figure 3-25 Potential shipwreck locations within the Tasmanian nearshore section of the study

area 4-12

Figure 3-26 Unverified geophysical anomalies in the offshore section of the study area 4-15

Figure 3.27 Unverified geophysical anomalies in the Victorian nearshore section of the study

area 4-16

Figure 3-28 Unverified geophysical anomalies within the Tasmanian nearshore section of the study area 4-17 Figure 3-29 Shoreline of Bass Strait during different periods of sea level rise 4-19

Figure 3-30 Locations of submerged cultural landforms in the offshore section of the study area 4-22

Figure 3-31 Locations of submerged beach ridge formations 4-23

Figure 3-32 Sub-bottom profile data identifying an estuarine channel (left panel) and a terrestrial

analogue of the estuarine channel, Shallow Inlet, Wilson Promontory (right panel) 4-24

Figure 3-33 Core sampling locations in relation to the project alignment 4-25

# Tables

## Chapter 1 Introduction

Table 1-1 Interests and concerns raised by the maritime stakeholders 1-5

## Chapter 2 Marine ecology

Table 2-1 Legislation, policy and guidelines relevant to the marine ecology assessment 2-7

Table 2-2 Offshore seabed zones and dominant seabed types 2-13

Table 2-3 Average water quality for offshore Bass Strait and nearshore Victoria (2020 to 2021) 2-14

Table 2-4 Geomagnetic field component along the project alignment 2-15

Table 2-5 Offshore benthic community zones 2-17

Table 2-6 Waratah Bay benthic community zones 2-18

Table 2-7 Summary of conservation status, PMST search data and likelihood of occurrence 2-23

Table 2-8 Conservation status, PMST search data and likelihood of occurrence of pinnipeds 2-29

Table 2-9 Conservation status, PMST search data and likelihood of occurrence of sea turtles 2-30

Table 2-10 Conservation status, PMST search data and likelihood of occurrence of marine birds 2-32

Table 2-11 Marine bird breeding BIAs within 50 km of the project alignment 2-35

Table 2-12 Marine bird foraging BIAs in Bass Strait 2-36

Table 2-13 Conservation status, and likelihood of occurrence of shore and wetland birds 2-37

Table 2-14 Summary of conservation status and likelihood of occurrence of migratory marine fishes within the PMST search area 2-41

Table 2-15 Likelihood of occurrence of threatened marine invertebrates known to occur in Victorian

waters 2-43

Table 2-16 Summary of EPBC Act (Cwlth) PMST results 2-44

Table 2-17 IMS likelihood of occurrence and distance from project 2-46

Table 2-18 Noise threshold levels for marine fauna groups 2-57

Table 2-19 Calculated distances from noise source to adopted noise threshold levels for marine fauna groups 2-61

Table 2-20 Project HVDC cable heating assessment results 2-75

Table 2-21 EPRs 2-77

Table 2-22 Summary of residual construction and operation impacts on marine ecology values 2-83

Table 2-23 Reasonably foreseeable marine-based projects in Bass Strait 2-90

Chapter 3 Marine resource use

Table 3-1 Legislation and guidelines relevant to marine resources assessment 3-5

Table 3-2 Summary of target species in Commonwealth managed fisheries 3-9

Table 3-3 Summary of target species in Victorian managed fisheries 3-10

Table 3-4 Summary of marine activities and uses 3-14

Table 3-5 EPRs 3-21

Table 3-6 Summary of construction and operation impacts on marine resource use 3-23

## Chapter 4 Underwater cultural heritage

Table 4-1 Key legislation relevant to the assessment of underwater cultural heritage 4-5

Table 4-2 Outline of geophysical anomalies in the offshore, Victorian nearshore and Tasmanian

nearshore sections of the study area 4-14

Table 4-3 Predicted presence and condition of archaeological features in the identified

submerged landforms 4-26

Table 4-4 Predicted heritage significance of maritime heritage site types in the study area 4-29

Table 4-5 Predicted heritage significance of potential Aboriginal cultural heritage artefacts in the

study area 4-30

Table 4-6 Impact of a grapnel run and cable trenching on potential maritime heritage values in

the offshore section of the study area 4-33

Table 4-7 Impact of a grapnel run and cable trenching on potential maritime heritage values in

the Victorian nearshore sections of the study area 4-34

Table 4-8 Impact of a grapnel run and cable trenching on potential maritime heritage values in the Tasmanian nearshore sections of the study area 4-34

Table 4-9 Impact of a pre-lay grapnel run on the beach ridge strandplain and associated site

type 4-35

Table 4-10 Impact of cable trenching on submerged landforms and associated site type 4-36

Table 4-11Impact of rock armour and concrete mattresses on potential maritime heritage sites in the offshore section of the study area 4-37

Table 4-12 Impact of rock armour and concrete mattresses on potential maritime heritage sites

in the Victorian nearshore section of the study area 4-37

Table 4-13 Impact of rock armour and concrete mattresses on potential maritime heritage sites

in the Tasmanian nearshore section of the study area 4-38

Table 4-4 Impact of rock armour and concrete mattresses on potential Aboriginal cultural

heritage artefacts in identified submerged landforms 4-38

Table 4-15 Impact of anchoring on potential maritime heritage values in the offshore section of

the study area 4-40

Table 4-16 Impact of anchoring on potential maritime heritage values in the Victorian nearshore section of the study area 4-41

Table 4-17 Impact of anchoring on potential maritime heritage values in the Tasmanian

nearshore section of the study area 4-41

Table 4-18 Impact assessment of HDD on potential maritime heritage sites in the Victorian

nearshore section of the study area 4-42

Table 4-19 Impact assessment of HDD on potential maritime heritage sites in the Tasmanian

nearshore section of the study area 4-42

Table 4-20 Impact of scouring from rock armour and concrete mattresses on the potential

maritime heritage sites in the offshore section of the study area during operation 4-44

Table 4-21 Impact of scouring from rock armour and concrete mattresses on the potential maritime heritage sites in the Victorian nearshore section of the study area during

operation 4-45

Table 4-22 Impact of scouring from rock armour and concrete mattresses on the potential maritime heritage sites in the Tasmanian nearshore section of the study area during

operation 4-45

Table 4-23 Impact assessment of scouring from rock armour and concrete mattresses on

potential Aboriginal cultural heritage artefacts in the identified submerged landforms 4-45

Table 4-24 EPRs 4-47

Table 4-25 Summary of residual impacts, potential mitigation measures and EPRs for maritime heritage 4-49 Table 4-26 Summary of residual impacts, potential mitigation measures and EPRs for Aboriginal

cultural heritage artefacts 4-50